JUNE 1951

Plant Engineering

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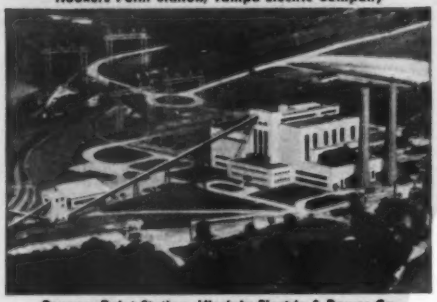
The magazine that helps plant engineers with their everyday problems

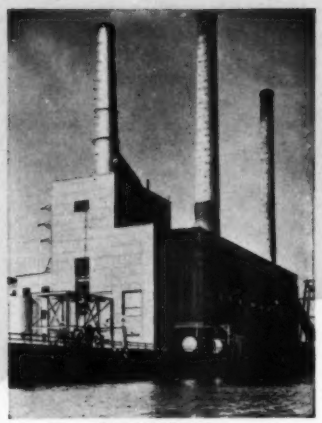
Hookers Point Station, Tampa Electric Company



Possum Point Station, Virginia Electric & Power Co.

Louisiana Station, Gulf States Utilities Company

Venice No. 2 Plant, Union Electric Power Company



Riverside Station,
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Stone & Webster
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and using

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WADSWORTH, OHIO

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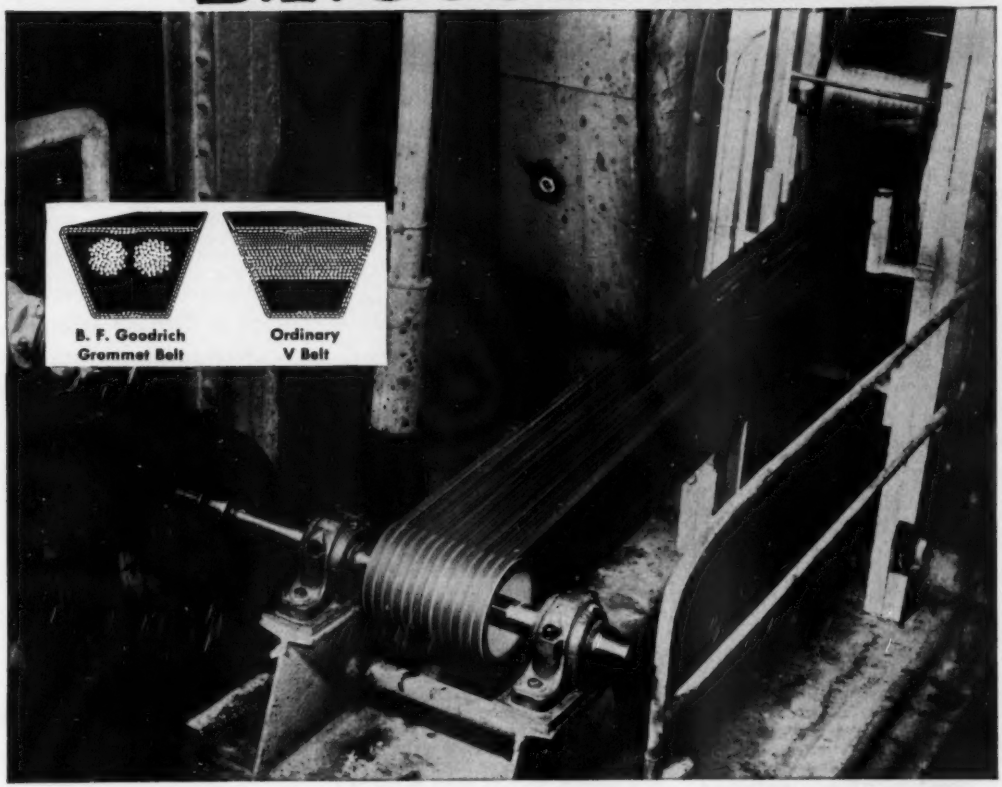
FORGED AND CAST STEEL · IRON · BRONZE

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Belt service tripled by changing to B. F. Goodrich grommet belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

ORDINARY V belts on this drive (a big fan for drying grain) lasted 1674 hours. The company wanted to cut costs by getting longer life from belts so they called in a B. F. Goodrich man and B. F. Goodrich grommet belts were installed. Grommet V belts ran 5153 hours . . . more than three times longer than ordinary belts. Why is this a typical example of grommet belt performance — why do grommet V belts outlast other belts?

Endless — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

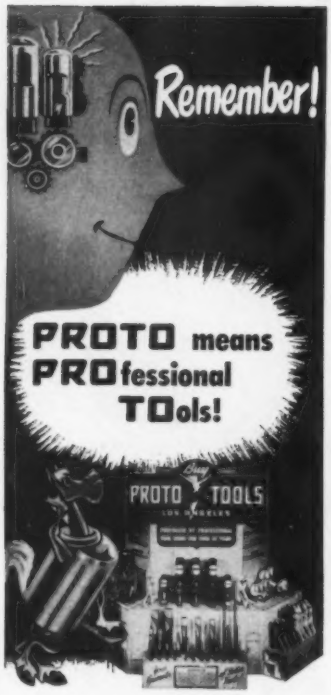
Better grip, less slip — Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B.F.Goodrich has the grommet! — No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY



That Power Sockorse pose is a reminder to remember that PROTO signifies highest professional standards. PROTO tools are light but strong, balanced, easy handling, snug fitting. They're properly forged from special steels and scientifically heat treated to impart extra strength, toughness and life! Buy PROTO tools from your dealer's big selection, while still obtainable. Send 10¢ for 68-page catalog to

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Master Puller Set 4000AB makes hundreds of puller set-ups because PROTO puller parts are interchangeable.

5184

PROTO TOOLS
LOS ANGELES

'ROUND ABOUT with the editors in field and office

Plant Engineering Wins Safety Award for 3rd Year

FOR THE THIRD consecutive year PLANT ENGINEERING has received a public interest award from National Safety Council for "exceptional service to safety."

"The tremendous voluntary contribution to safety reviewed by the judges of this award is an impressive example of the way public information media in our nation pitch in when public welfare is at stake," said Ned H. Dearborn, president of the Council, in making the awards. "The sense of responsibility, the leadership and the plain hard work that went into the public information effort by media undoubtedly played a vital role in the reduction of the over-all accidental death rate to a record low last year."

Uncle Sam's Controls Seem a Bit Tardy

BUSINESS COMMENT is a well edited and timely house organ of the Northern Trust Co. of Chicago. The following pertinent comments from that publication have a direct bearing on future industrial planning activity.

"Until general controls were announced January 25 prices were continuing to advance sharply and except for farm products and food were establishing new record highs for the post-war period or for all time. No significant slowing down of the rate of increase was apparent.

"The most volatile were industrial raw material prices, an average of 16 of which have risen 10 per cent in the past month and almost 75 per cent since last March. The principal nonferrous metals except tin have, however, remained steady for three months or more.

"Textile products are on the average 25 per cent above a year ago, chemicals and allied products 23 per cent, building materials 17 per cent and metals and products 12 per cent. Only in 1946, when the war-created cost and money supply factors began to be reflected in decontrolled price was the rise at all comparable to that just experienced.

"The economic report and budget message of the President disclosed that defense spending including our military establishment and economic and military aid to other nations was now running at an annual rate of $20 billion which is about 7 per cent of a gross national product of $297 billion. By the end of the year, according to these messages, military and foreign aid spending should attain an annual rate between $45 and 55 billion. The latter figure would be 18 per cent of our national product.

"It is estimated that in the year before Korea, when military spending and foreign aid amounted to about $18 billion, no more than one third went for hard goods. A rough and unofficial estimate is that at least 60 per cent of the projected expenditures will go for hard goods."

Circular on Available Buildings

A HELPFUL circular has been compiled listing 100 industrial buildings which are available in the state of Missouri. The circular gives the floor space, type of construction, whether the building is for sale or lease, whether it has railroad sidings, the town where the building is located, and the name of the person to contact regarding the building. This circular is available from James Idol, State Office Building, Jefferson City, Missouri.

What Do You Think about a Plant Engineer's Education?

THIS IS A BIT of trivia, or to paraphrase a well-known commentator, "a reporter's report to plant engineers."

Some 2 years ago in connection with another subject, a survey was made of various engineering schools. The only conclusion that could be drawn from this was that: the plant engineer is largely an unknown factor to the average engineering student; very few engineering schools recognize this as a possible future for their graduates; and many of the others disregard it or consider it as a segment of industrial engineering.

The article in our May 1950 issue told the reactions of a young plant engineer after working in it for a year, told where it fit into the organization and some of the things that he did. This article was sent to 50 deans of engineering schools. From this some 37 replies were received. These replies indicated: an increasing interest in, and appreciation of, plant engineering from the standpoint of the student; a distinct aversion toward further specialization in education; and a definite tendency to classify plant engineering as a minor phase of industrial engineering.

To those interested in the manufacturing industries all engineering might

(Continued on page 144)

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64 P. L. & R. authorized by Post Office.

It's easier to maintain ARMSTRONG TRAPS

THEY SELDOM NEED ATTENTION

GOOD preventive maintenance of course calls for periodic steam trap inspection. To look inside an Armstrong trap you simply remove the cap and lift out the entire mechanism, which is connected to it. The body full of boiling water remains in the line and need not be handled.

Only rarely does inspection reveal the need for cleaning or repairing an Armstrong trap. The swirling action of the condensate during discharge continuously scrubs the trap clean. The hardened chrome steel valve and seat stay steam-tight for a long, long time without attention. There is no wire drawing. The leverage system is almost completely friction-free, will operate hundreds of thousands of times without wearing out.

For trouble-free trap performance there is nothing to compare with an Armstrong. Your local Armstrong representative can help you select the right size traps for your requirements. Call him.

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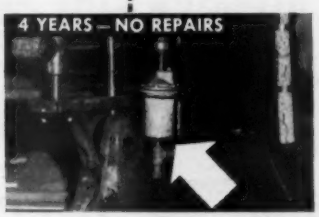
912 Maple Street • Three Rivers, Michigan

Armstrong traps on low pressure heating systems require far less maintenance than previous traps...*John Deere Harvester Works, East Moline, Illinois.*



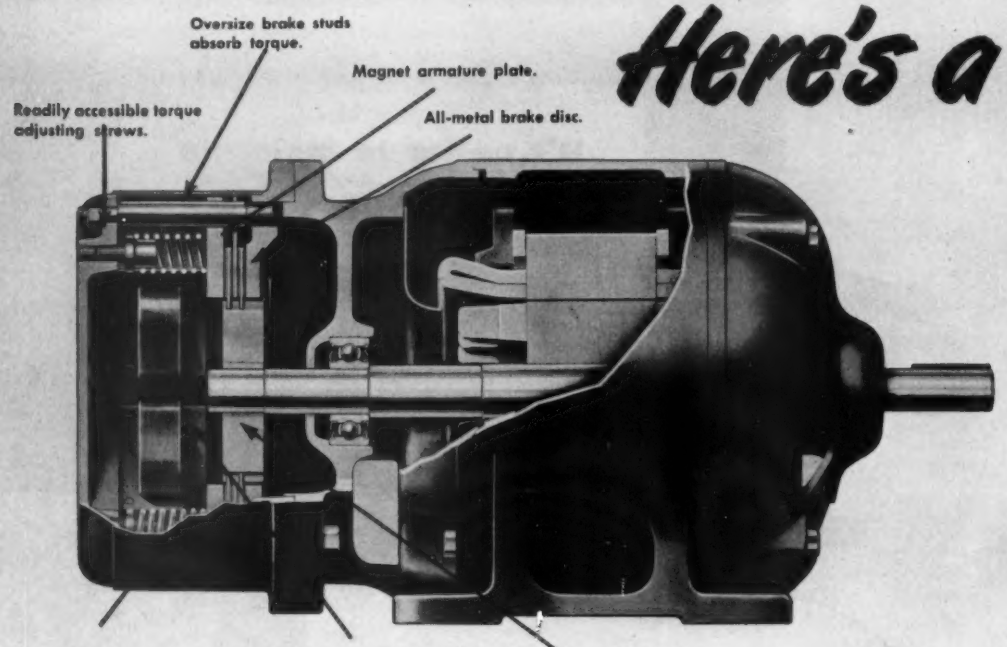
"4 to 5 years service without replacement parts is average on traps draining driers. Some traps in service with no parts for 7 or 8 years — and one for 15 years!"—*Weymouth Art Leather Co., South Braintree, Massachusetts.*

THE ARMSTRONG SERVICE GUIDE explains trap maintenance and repair, contains useful trouble shooting tips. Send for your free copy.

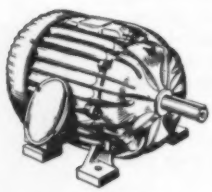
SEE OUR CATALOG IN SWEET'S or CEC

ARMSTRONG STEAM TRAPS

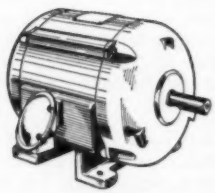
Here's a


Oversize brake studs absorb torque.
Magnet armature plate.
Readily accessible torque adjusting screws.
All-metal brake disc.
Wrap-around band cover, for totally-enclosed protection and easy removal.
Core plated "E" magnets. Readily accessible. Location keeps heat away from motor.
Large brake spline with many teeth.

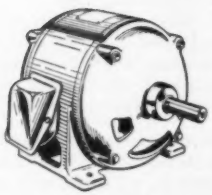
Other ELLIOTT C-W motors for special and general use . . .



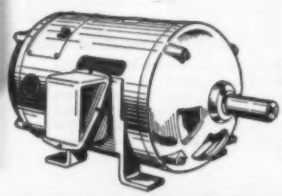
TYPE CFC
Squirrel cage, "Sealed Power," Totally-Enclosed, Fan-cooled



TYPE BE
Squirrel cage, Totally-Enclosed, Non-Ventilated



TYPE BA
Squirrel cage, open-drip-proof (protected)



TYPE BW
Wound rotor, Open-drip-proof (protected)

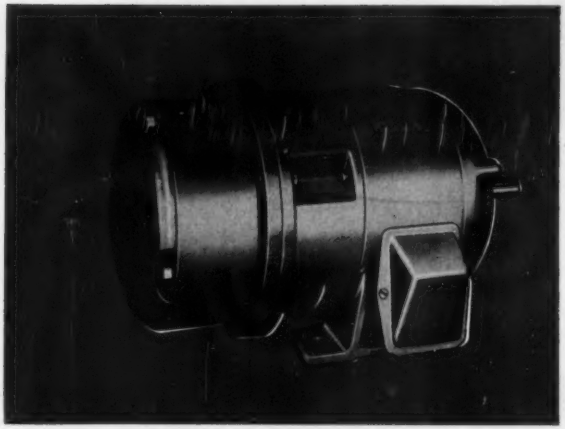
ELLIOTT COMPANY

brake that can take it!

The Elliott CROCKER-WHEELER BRAKE MOTOR

QUICK STOPS AND STARTS are taken in every day stride by this rugged brake motor. Its all-metal *bonded* brake linings dissipate heat faster, wear longer and are immune to dampness, cold and other "brake killers." In performance, the powerful magnetic braking action is instantaneous—and sure.

Moreover, the Elliott C-W brake is tops in compactness and adaptability. It can be mounted on double shaft extension NEMA standard D flange or C face motors without the need of mounting brackets or adapters. Teamed with an efficient Elliott C-W motor (protected or totally-enclosed types), it's a combination that's hard to match.



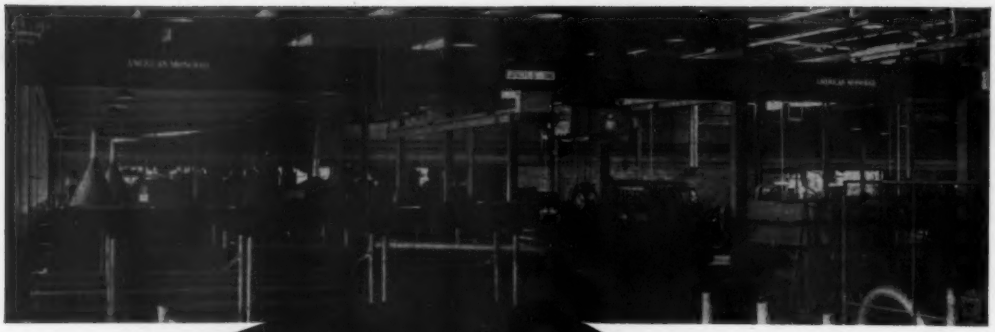
The Elliott C-W Brake-Motor. Note the simple, wrap-around cover on the brake to give totally-enclosed protection.

SEND FOR THIS BULLETIN

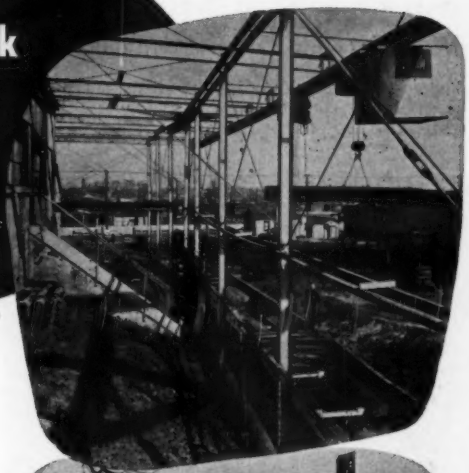
It gives you all the details of construction and applications. Ask for BRAKE MOTOR BULLETIN SL-610-1 and address your request to Elliott Co., Dept. P.E., Jeannette, Pa.

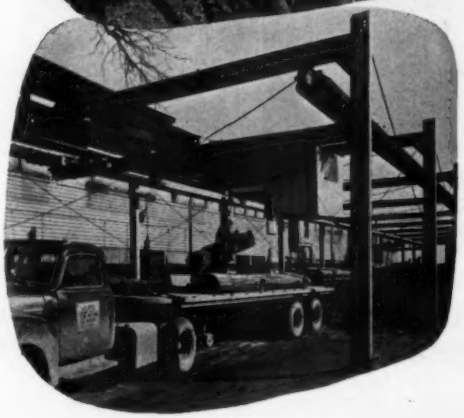
ELLIOTT C-W motors range from 1 to 200 hp. Large ELLIOTT motors and generators are built by the RIDGWAY DIVISION in Ridgway, Pa.

CW-23



15 Tons of Bar Stock Unloaded and Stored in 30 Minutes





It takes only 30 minutes, with 3 men, to unload 15 tons of bar stock from trailer to storage yard with this 5-ton American MonoRail crane. An average of 27 tons per day from storage yard to processing, is a smooth continuing operation day after day.

This is the easiest and best way to handle bar and sheet stock because American MonoRail Overhead Handling Equipment increases production, saves labor, saves time, and cuts costs.

American MonoRail engineers will gladly show you how automatic handling pays and saves. Write today — ask for Bulletin C-1.

THE AMERICAN MONORAIL COMPANY

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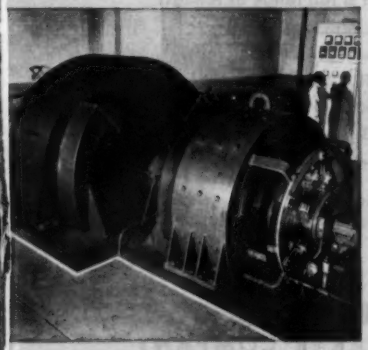
SCIENTIST at Cornell Aeronautical Laboratory gages thin oil film in wind tunnel's oil-cushioned balance system, which measures wind stresses on models to 1/100 of a pound. With the previous oil, rust particles formed, made accurate measurements nearly impossible. Frequent dismantling and cleaning were necessary at a cost of nearly $1,000 each time. Sunvis 931 Oil restored efficiency of the balance system and eliminated overhauls.

SUNVIS 931 OIL PREVENTS RUST, SPEEDS AIR RESEARCH PROJECT

Cornell Aeronautical Laboratory's transonic wind tunnel, valued at more than $3 million, determines the ability of planes to withstand winds up to 750 mph. Two years ago difficulties set in. In the delicate hydraulic balance system—where parts literally float on a film of oil—particles of rust were interfering with accurate measurements. Every few months the entire balance system had to be dismantled, thoroughly cleaned, then reassembled. But there is no problem today. It was solved when a Sun representative recommended Sunvis 931 Oil with "Job Proved" ability to prevent the formation of rust, corrosion, sludges, and gums.

"Job Proved" Sunvis 900 Series Oils are unsurpassed in quality. Under normal operating conditions *they are good for the life of your machinery*. For complete information, call or write your nearest Sun Office.



WINDS UP TO 750 MPH are generated by these two 12,000 hp electric motors directly connected to the main shaft. Sunvis 931 Oil lubricates and protects them, too.

TWO HIGH-SPEED propellers are also lubricated by Sunvis 931 Oil. It remains free-flowing, nonsludging, after more than two years' rigorous service.

TEST PILOT PREPARES for the take-off, confident in the knowledge that scientific laboratory pretesting has minimized the risks he runs.

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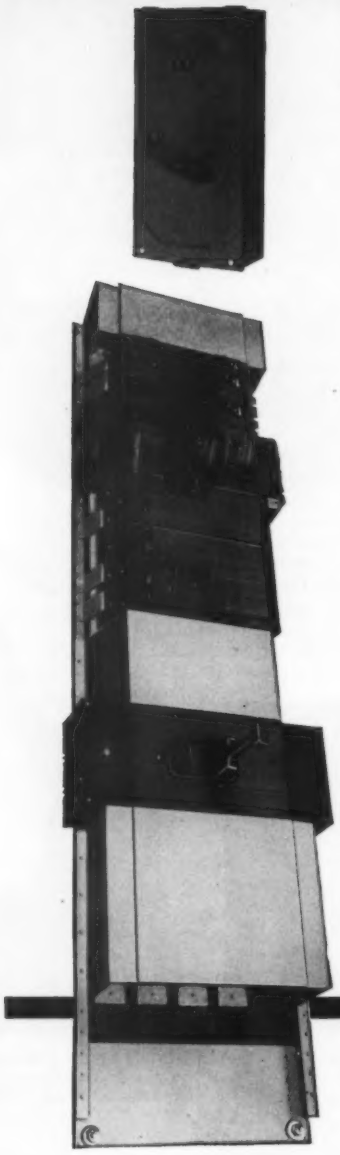

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Continuous current 10—600 amperes

Interrupting capacity 5000—25,000 amperes

1, 2, or 3 poles

Approved by the Underwriters Laboratories, Inc.

For further information on circuit breakers to meet your needs, write I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pennsylvania.

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SELECT THE RATINGS AND DEVICES TO FIT YOUR APPLICATION

			KD 50 Amp Frame	ET 50 Amp Frame Ft. and Ind. Mtg.	ET 100 Amp Frame "F"	ET 100 Amp Frame "G"	ET 225 Amp Frame "K"	ET 600 Amp Frame "L"
			1 and 2 Pole	1, 2 and 3 Pole	2 and 3 Pole	2 and 3 Pole	2 and 3 Pole	2 and 3 Pole
Ratings	Ampere Ratings		10–50 A	15–50 A	15–100 A	50–100 A	70–225 A	125–600 A
	A-C Voltage Ratings		1 P-120 V 2 P-120/240 V	1 P-125 V 2 and 3 P-250 V	L.V-250 V HV-600 V	L.V-250 V HV-600 V	L.V-250 V HV-600 V	L.V-250 V HV-600 V
	D-C Voltage Ratings		—	1 P-125 V 2 and 3 P-125, 250 V	LV-125/250 V HV-250 V	LV-125/250 V HV-250 V	125/250 V and 250 V	125/250 V and 250 V
	Interrupting Ratings	a-c	5,000 A	5,000 A	L.V- 5,000 A HV 10,000 A	—	10,000 A	10,000 A
	Underwriters' Labs. Inc.	d-c	—	5,000 A	5,000 A	—	10,000 A	10,000 A
	Interrupting Ratings	a-c	5,000 A	5,000 A	L.V- 5,000 A HV-15,000 A	15,000 A	15,000 A	25,000 A
	NEMA	d-c	—	5,000 A	L.V- 5,000 A HV-10,000 A	5,000 A 10,000 A	10,000 A	20,000 A
	Quick-Make,Quick-Break Mechanism		✓	✓	✓	✓	✓	✓
Protective Devices	Thermal Trip	N	—	✓	—	—	—	—
		I	—	—	—	—	—	—
	Thermal Fixed Magnetic Trip	N	✓	—	✓	✓	—	—
		I	—	—	—	—	—	—
	Thermal Adjustable Magnetic Trip	N	—	—	—	—	—	—
		I	—	—	—	—	✓	✓
	Adjustable Magnetic Trip	N	—	—	✓*	—	—	—
		I	—	—	—	—	✓*	✓*
	Undervoltage Trip		—	—	✓	✓	✓	✓
Other Devices	Shunt Trip		—	—	✓	✓	✓	✓
	Auxiliary Switch		—	—	✓	✓	✓	✓
	Alarm Switch		—	—	✓	✓	✓	✓
	Mechanical Interlock		—	—	✓	✓	✓	✓
	Field Discharge Contact		—	—	✓	—	✓	✓
Other Features	Non-Automatic		—	✓	✓	✓	✓	✓
	Oil Immersed		—	—	✓*	—	✓*	✓*
	Center Studs		—	—	✓	✓	✓	✓
	Drawout Connectors		—	—	✓	—	✓	✓

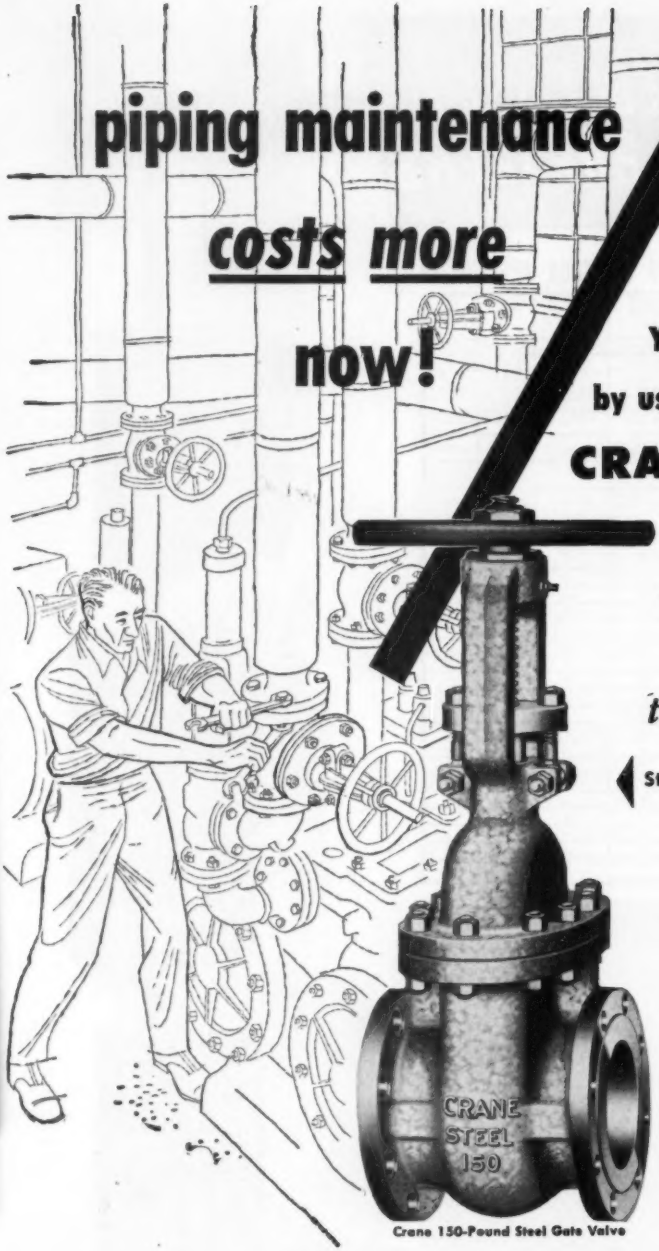
* —Available in 250 V d-c, 600 a-c only.
N—Non-interchangeable overcurrent trip.
I —Interchangeable overcurrent trip.

WANT MORE INFORMATION?

Bulletin 5004-D gives description of the complete I-T-E line.

Catalog Section 5000 contains technical selection and application data, dimensions and prices. It's yours for the asking.

piping maintenance *costs more* now!



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You spend less for it by using Dependable Quality

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Mounts Right in the Air Duct—

Saves space, installation costs, gives you quieter, more efficient ventilation!

Write for Bulletins, or

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JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

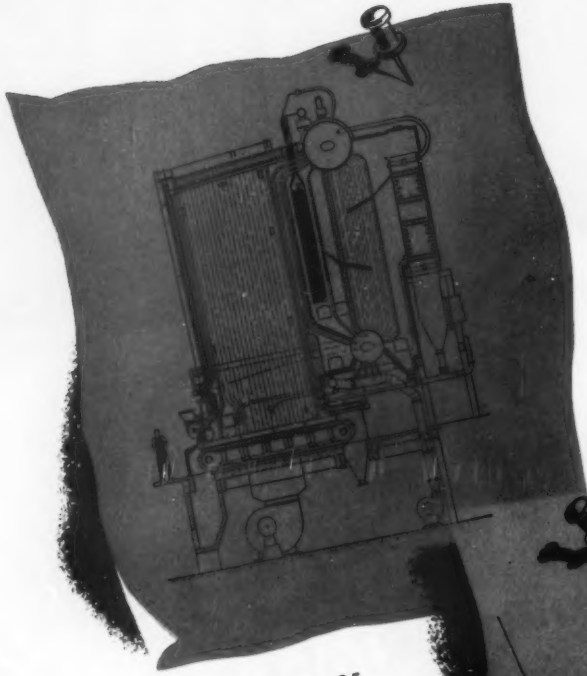
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

They keep coming

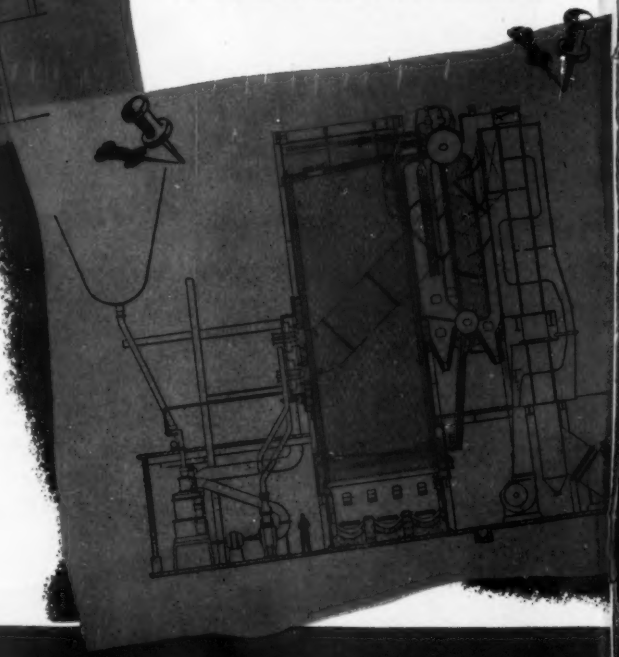
Companies that have bought VU Boilers *continue to buy them.* In fact, a substantial proportion of all VU Units, in service and on order, have been purchased by organizations whose selection reflects their own first-hand experience. *For example —*

A STEEL COMPANY now has a total of eleven VU Boilers in four different plants. Starting with three units in 1936, it has reordered three times... most recently in the fall of last year with an order for three more units.

A TEXTILE MANUFACTURER ordered two VU Units in 1936. Another unit was installed in 1940 and a third in 1944. Still another



VU-50 Unit fired with C-E Spreader Stoker (continuous discharge type). The capacity of unit shown is 80,000 lb steam per hr; operating pressure 425 psi steam temperature 650 F.



VU-50 Unit fired with pulverized coal. The capacity of unit shown is 200,000 lb of steam per hr; operating pressure 560 psi; steam temperature 760 F (VU units are in service for capacities up to 350,000 lb of steam per hr).

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

back for more!

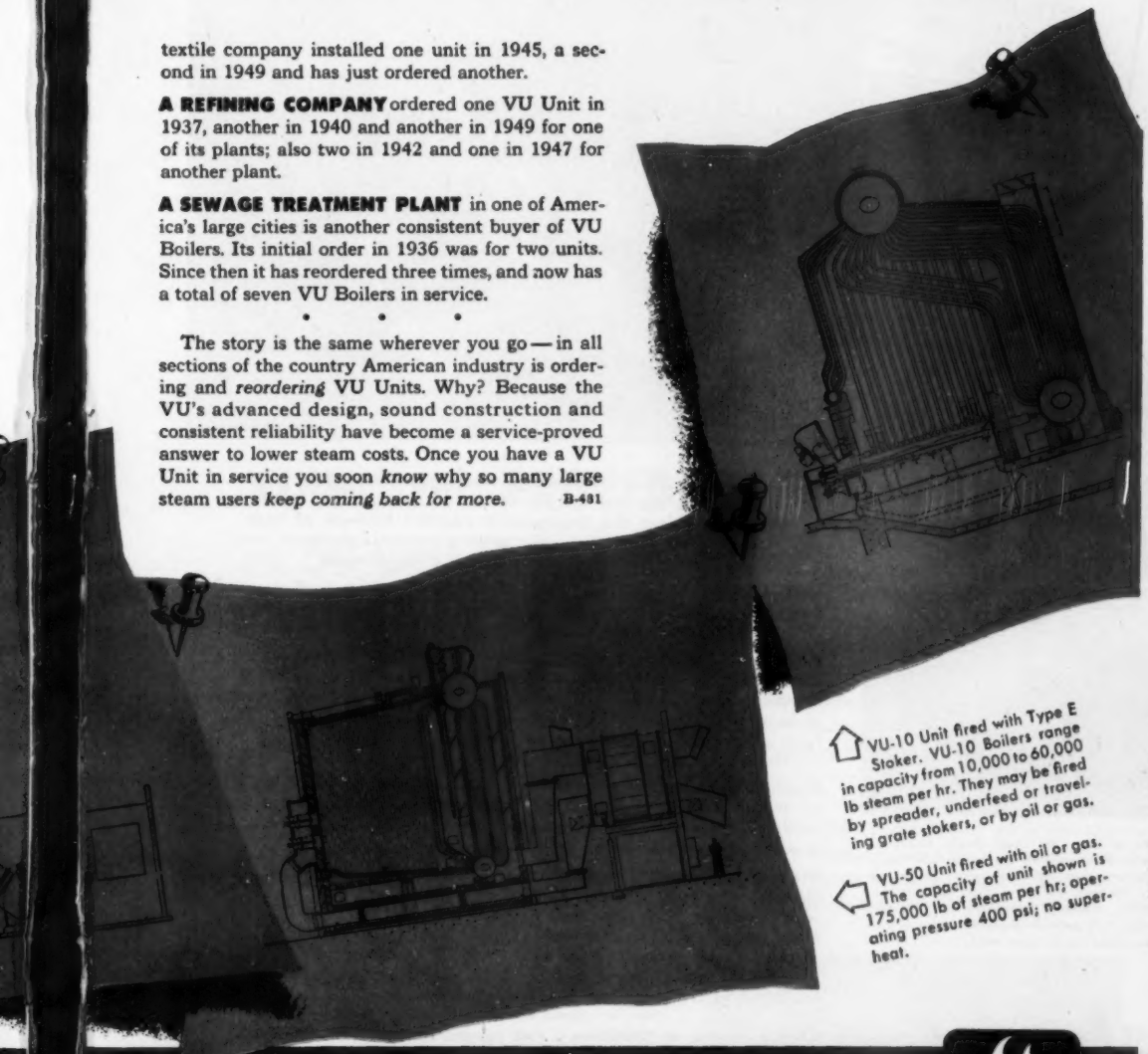
textile company installed one unit in 1945, a second in 1949 and has just ordered another.

A REFINING COMPANY ordered one VU Unit in 1937, another in 1940 and another in 1949 for one of its plants; also two in 1942 and one in 1947 for another plant.

A SEWAGE TREATMENT PLANT in one of America's large cities is another consistent buyer of VU Boilers. Its initial order in 1936 was for two units. Since then it has reordered three times, and now has a total of seven VU Boilers in service.

• • •

The story is the same wherever you go — in all sections of the country American industry is ordering and *reordering* VU Units. Why? Because the VU's advanced design, sound construction and consistent reliability have become a service-proved answer to lower steam costs. Once you have a VU Unit in service you soon *know* why so many large steam users *keep coming back for more.* B-481



VU-10 Unit fired with Type E Stoker. VU-10 Boilers range in capacity from 10,000 to 60,000 lb steam per hr. They may be fired by spreader, underfeed or traveling grate stokers, or by oil or gas.

VU-50 Unit fired with oil or gas. The capacity of unit shown is 175,000 lb of steam per hr; operating pressure 400 psi; no superheat.

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

C-E

★

DEMPSTER DUMPSTER SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

Photos show the three simple stages of servicing a container. The Dempster-Dumpster, operated from hydraulic controls in the cab by one man, the driver, picks up each container, places it in carrying position, and hauls it to point of disposition where it may be dumped or set down intact.

● **The General Electric Company, well known for sound management, is among the hundreds of cost-minded manufacturers using the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs!**

Cuts Cost of Equipment and Operation — One truck-mounted Dempster-Dumpster performs the work of from 3 to 5 conventional trucks . . . reducing investment, maintenance and man hours tremendously.

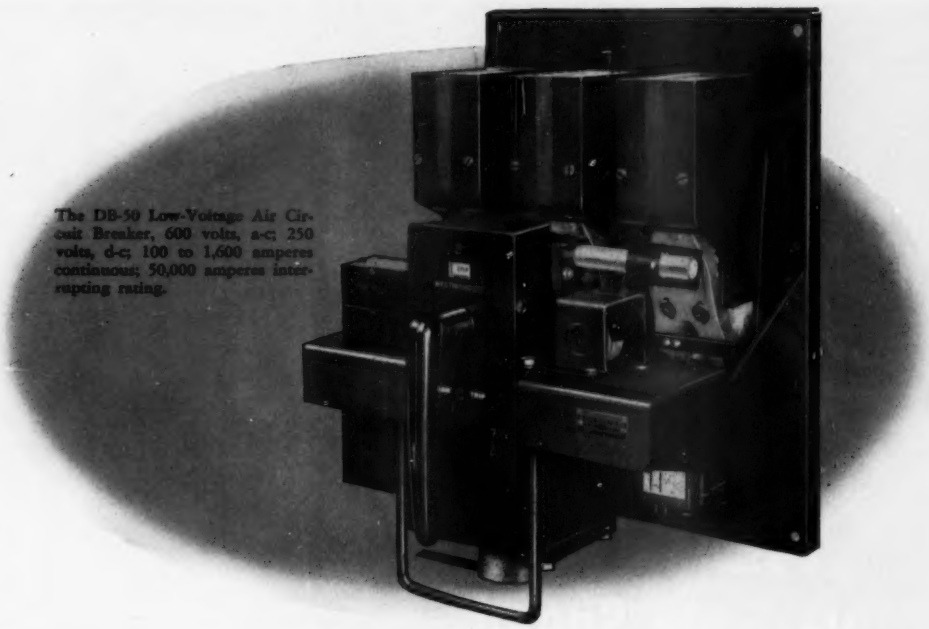
Eliminates Standing Idle Time—Truck never stands idle while being loaded nor do loading crews stand idle while truck makes haul. One Dempster-Dumpster services any number of detachable containers ranging in size up to 12 cu. yds. and in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish.

Eliminates Re-Handling of Materials—Dempster-Dumpster Containers are placed at the very spot where materials accumulate—inside or outside buildings. Materials placed in these containers remain there until taken to destination and dumped or set down intact.

Increases Efficiency, Sanitation and Good "Housekeeping"—The Dempster-Dumpster System is a complete, unified plan for plant-wide cleanliness. Containers built to handle trash and refuse are fire-proof, rat-proof and fly-proof. Contents cannot be scattered by wind or scavengers. Regardless of your particular materials handling problem . . . raw products, finished products, trash or rubbish—it will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

DEMPSTER BROTHERS - 161 Shea Building - Knoxville 17, Tennessee



The DB-50 Low-Voltage Air Circuit Breaker, 600 volts, a-c; 250 volts, d-c; 100 to 1,600 amperes continuous; 50,000 amperes interrupting rating.

NOW...the PROVED DB Breaker Design in 50,000-Ampere Interrupting Rating

Here's the third member of the DB Air Circuit Breaker family. It's the new DB-50—a modern breaker that fulfills your need for higher interrupting capacity on low-voltage circuits.

Of the same uniform design as the DB-15 and DB-25, the DB-50 includes . . . complete shielding for extra safety . . . subassemblies that are removable as complete components . . . a rigid all-metal mounting base. General construction and operating characteristics are similar to the DB-15 and DB-25 breakers.

To match the improved performance offered by the new 50,000-ampere breaker, a series tripping device has been developed which provides all the basic delay characteristics required for motor circuit protection or for use in selective tripping systems. By use of filtered air as the escapement medium and by incorporating adjustable features to all pickup and delay settings, a tripping device has been provided which is both versatile in application and precise in operation.

Booklet B-4740 contains complete information on the DB-50. The DB-15 and DB-25 units are covered in B-4067. For copies, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60747

See "Electrical Proving Ground" . . . *the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse representative, or write Westinghouse, Film Division, Box 868, Pittsburgh 30, Pennsylvania.*

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

WESTINGHOUSE

"DE-ION" CIRCUIT BREAKERS

REEVES Variable Speed Transmission

The *original*, mechanically correct unit for providing complete, stepless speed adjustability.

Industry's most widely used unit for adjusting machine speeds . . . for all these good reasons:

1. Incorporates the REEVES operating principle—proved in 300,000 installations—which assures *accurate, positive* delivery of any desired speed within the entire speed range, without stopping the machine.

2. Makes "changeovers" easier—utilizes the machine's *full* capacity—by providing the *right* speed—with the turn of handwheel or touch of button—for every operation and every operator, under every changing condition.

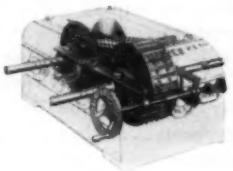
3. Wide choice of vertical and horizontal models—capacities up to 87 hp; in speed ratios of 2:1 to 16:1; manual, electric, hydraulic or completely automatic controls; suitable for mounting in any position. Also "Internals" for mounting within machine framework.

4. Easily installed on your machines. Ruggedly constructed with few moving parts subject to wear . . . requires no special tools or training to maintain.

5. Used on more different kinds of machines in a greater variety of industries than any other single variable speed drive.

Profit from REEVES Speed Control in your plant—*see immediate results.* Send for full details on REEVES Speed Control—ask for catalog No. PE 68-G.

Operating Principle



REEVES Variable Speed Transmission embodies the proved operating principle of a V-belt driving between two pairs of cone-shaped discs, mounted on parallel shafts and adjustable to form an infinite number of driving and driven diameters. One shaft receives power at constant speed from motor, line shaft, etc. Other shaft delivers power at infinitely variable speeds to driven machine. Each speed setting is held without fluctuation. Operation is practically noiseless.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized leader in the specialized field of speed control engineering

accurate • variable
REEVES *Speed Control*

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Make piping permanent and leakproof

Write Dept. D-6 for free booklet listing properties of pipe and welding fitting and flange materials.

PIPING PERMANENCE is always important but now, more than ever, any installation of piping should be leakproof, maintenance-free and have extra long life. A piping system, big or small, is only as strong as its weakest component. That's why welding fittings, for example, should be specified with care.

TUBE-TURN Welding Tees are drawn from seamless tubing to a barrel shape—the shape every tee wants to assume under pressure. This feature, together with the generous crotch radius and thickness, explains why TUBE-TURN Welding Tees withstand more pressure without yielding. Bursting pressures obtained in tests of representative fittings have averaged more than 25% higher than required by standard codes. Here's extra quality at no extra cost.

Get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

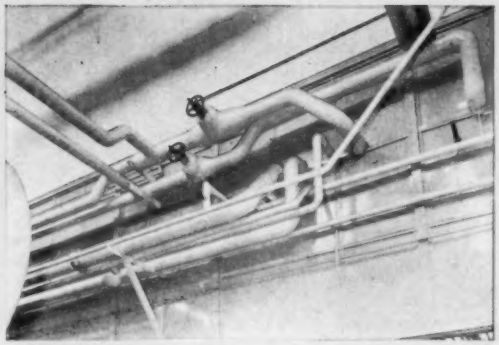
"Be sure you see the double tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

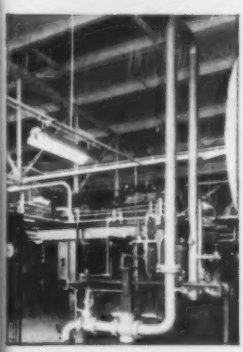
DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO . . . A wholly owned subsidiary of TUBE TURNS, INC.

Penicillin processor welds stainless steel piping ½" and up

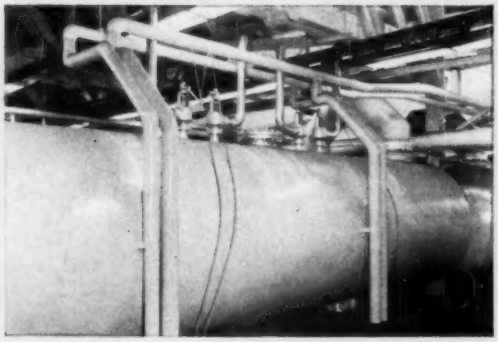
Advanced facilities in plants and laboratories help Eli Lilly and Co., Indianapolis, turn out a high volume of pharmaceuticals, biologicals, and antibiotics. This new filtration unit in the penicillin processing system uses 3" and 4" Type 316 stainless steel—chosen to resist corrosive action. Welded system with TUBE-TURN Welding Fittings and Flanges was chosen to provide maximum strength and eliminate leakage.



Neat appearance of insulated lines demonstrates simplicity of welded piping. Insulation was applied quickly over pipe and TUBE-TURN Welding Fittings, with no awkward joints to work around. Maintenance men know that insulation will last, with no leakage to cause deterioration. Cleanliness and neatness are prime requirements in Eli Lilly plants.



Up in the air goes a loop welded with 6" pipe, joined with TUBE-TURN Welding Fittings and Flanges. Structural strength here is a must. In this fermentation tank where life-saving penicillin is made, tiny lines of ½", as well as larger sizes, are welded. Comparable modern facilities are provided for making streptomycin and other products.



Lines to process vessel fit neatly into a small space when TUBE-TURN Welding Elbows make the turns. Eli Lilly engineers specified process piping for optimum flow conditions, compactness, and elimination of leakage.

TUBE TURNS, INC., Dept. D-6
224 East Broadway, Louisville 1, Kentucky

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Company .....
Nature of Business .....
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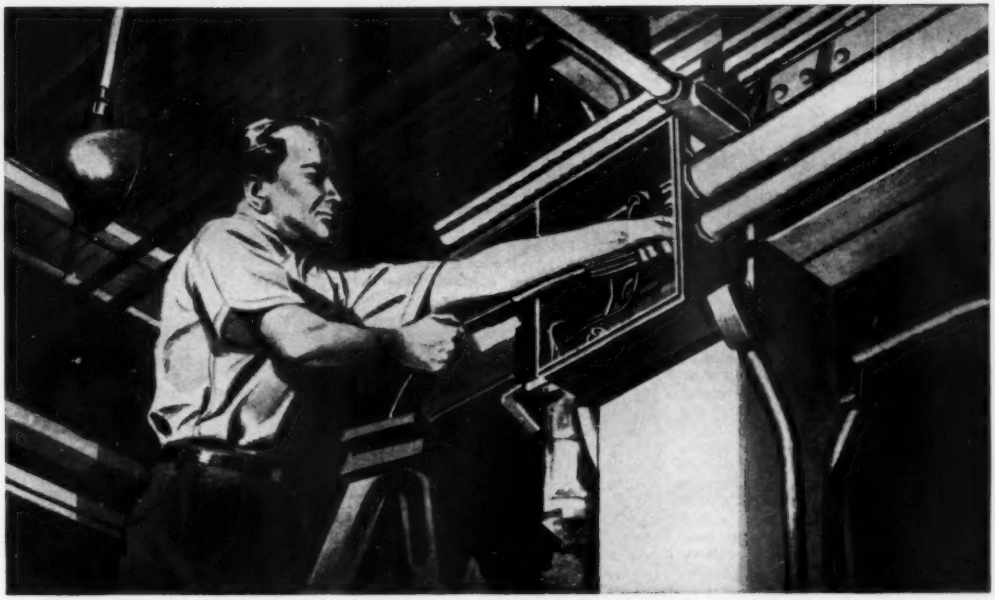
TUBE TURNS, INC.
LOUISVILLE, KENTUCKY



How to pack 64% more current into your existing raceways

Have you considered meeting today's extra load demands *without* adding new raceways? By installing General Electric Deltabeston* AVA cable in your present raceways, you actually may get as much as 64% more current-carrying capacity than ordinary 60 C cable can provide.

HERE'S WHY: G-E Deltabeston AVA cable is doubly insulated with heat-beating asbestos, plus No. 1799 varnished cambric. This combination permits the cable to operate effectively at higher copper temperatures. Thus, at normal ambient temperatures, AVA cable can safely carry *more current* than ordinary types. The inherent non-aging characteristics of asbestos give the extra advantages of long life and efficient operation.

When you modernize your electric system, look to Deltabeston AVA for savings in materials, dollars, time . . . with no raceways to replace, Deltabeston AVA cable is easy to install. And when planning *new* construction, specify Deltabeston AVA cable, so that you will be prepared for future load increases.

For more information, call on your local G-E distributor. Section W58-683, Construction Materials Department, General Electric Company, Bridgeport 2, Conn.

*Registered Trade Mark of General Electric Company

DELTABESTON
Wires and Cables
Built to beat the heat

You can put your confidence in—

GENERAL ELECTRIC

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Salvaging Metals from Waste

STRATEGIC metals from former wastes are helping to meet wartime demand. Several new processes yield valuable materials from mining residues, flue dusts, soot deposits and process liquors.

During the last war many of the huge slag dumps that accumulated around steel mills were combed for the masses of iron that sometimes escaped when the molten slag was run off. One company recovered 150,000 tons of scrap iron in one year from such an operation.

The rise of the flotation processes, where finely crushed ore is treated with chemicals to make the minerals gather in a froth on top of the water, has caused re-examination of many dumps left by less efficient processes. During World War II large accumulations of fluorite tailings and waste rock were treated in this fashion, with more than 90 per cent of the fluorite recovered. Lead, zinc, tin and gold have also been recovered by flotation.

Slag fuming is another method used to recover lead and zinc from waste piles. The desired metal is boiled up or fumed from the surface of a furnace-load of molten slag. The vapor is then converted to metallic oxides and cooled to a solid or a powder for further processing into finished metal.

Roasting of ore concentrates containing traces of the desired metal can result in concentrates many times richer than the starting material. The richest source of rhenium is molybdenite ore, which contains from 0.6 to 0.7 per cent molybdenum and only 0.0001 to 0.05 per cent rhenium. The flue dusts from roasting contain up to several per cent of rhenium and are the present source of supply. Rhenium is similar to tungsten and may be substituted for it in many applications. *From Industrial Bulletin, a publication of Arthur D. Little, Inc., Cambridge, Mass.*

Slip-Over Covers for Heading Barrels and Drums

A SIMPLE idea suggested by a transport foreman resulted in a new method of heading barrels and drums that may save users many thousands of dollars. The idea was born when the foreman watched his wife placing plastic covers over bowls before being placed in the refrigerator. He wondered if such a practice could be adopted at the plant for the barrels and drums used for storing and shipping dry and paste chemicals from one area in the plant to another.

Several materials were considered for the new covers. These included oiled paper, plastic and rubber sheeting and a neoprene-treated paper. The latter is produced by adding a small amount of neoprene latex to the paper pulp during the beating operation. The addition of a water dispersion of neoprene at this state of manufacture results in a paper having an unusually high wet strength, exceptional acid-and-alkali resistance and superior toughness.

The material is very good for heading chemical-laden barrels and metal drums that would be left out-of-doors for indefinite periods. Because the new covers are inexpensive and easy to put on and take off, it is believed they can be discarded after one-time use, and still save money. In actual service, however, experience shows the new lids can be used not once but many times. *From Neoprene Notebook, a publication of E. I. du Pont de Nemours and Co., Wilmington 98, Del.*

Neoprene-treated paper covers are used to cover chemical-laden barrels

Proper Bearing Maintenance

NEEDLESS FAILURE of a ball bearing involves much more than cost of replacement. A potential savings will be realized through an understanding of bearing failures and seeing that proper maintenance and corrective measures are taken.

Foremost among the causes of failure is improper lubrication. Each piece of equipment and each condition poses a different problem in lubrication. Low and high speed gears; gears and bearings operating as a unit; motors in wet and dry

Work Safely — Work with Protective Equipment — When Sand-Blasting, Spraying, and for Hot Metals

Here are three excellent examples of men using protective equipment to save life and limb from possible injury while working. Left, man is donning helmet which will protect him from possible injury while sand blasting. Center, sprayer wears protective hood to protect his eyes, ears, nose and mouth from paint. Right, face shield, melters' goggles, leather gloves, leggings and safety shoes are the items of protective equipment used by this man when working with white-hot metal. (From The Westerner, a publication of Western Cartridge Co., and Affiliates of East Alton, Illinois.)

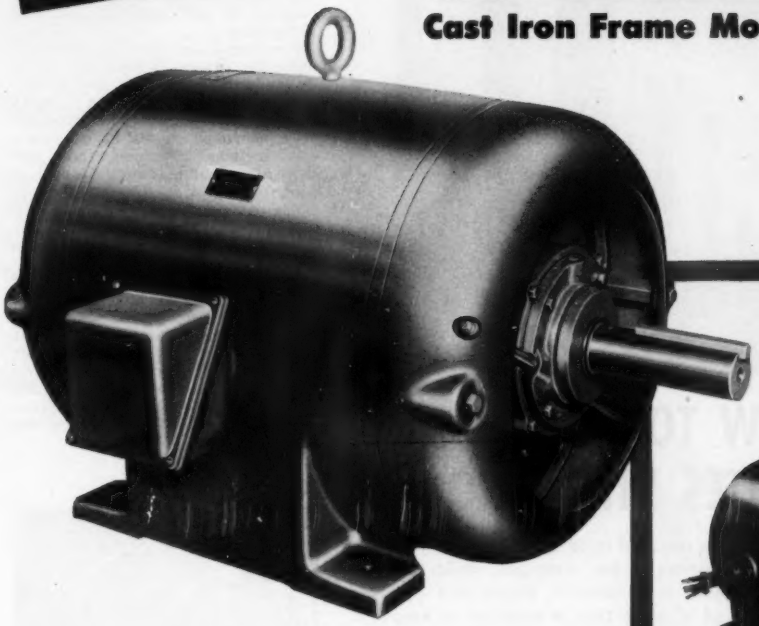
Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

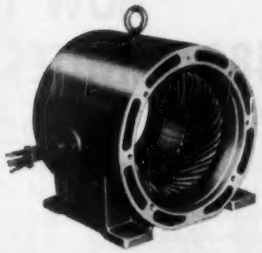
corrosion is no problem—

WHEN YOU USE

Wagner

Cast Iron Frame Motors





Rugged, one piece, corrosion-resistant, cast iron inner and outer frame, showing openings for ventilation.

They resist the damaging action of acids, fumes, moisture and other destructive elements

Wherever corrosion resistance is a "must" for motors—in chemical plants, oil fields, refineries, and industrial plants where tough operating conditions exist—Wagner Cast Iron Frame Motors are a sound choice.

They feature special varnish treated windings that resist acids and alkalies . . . a cast iron, gasket-sealed conduit box . . . and drain plugs in the endplates for easy removal of condensation from inside the motor. They are totally enclosed in rust and corrosion-resistant cast iron—even the nameplate is made of corrosion resistant material!

Wagner Cast Iron Frame Motors are available in ratings from 5 to 250 horsepower, in both standard totally-enclosed fan-cooled and explosion-proof designs.

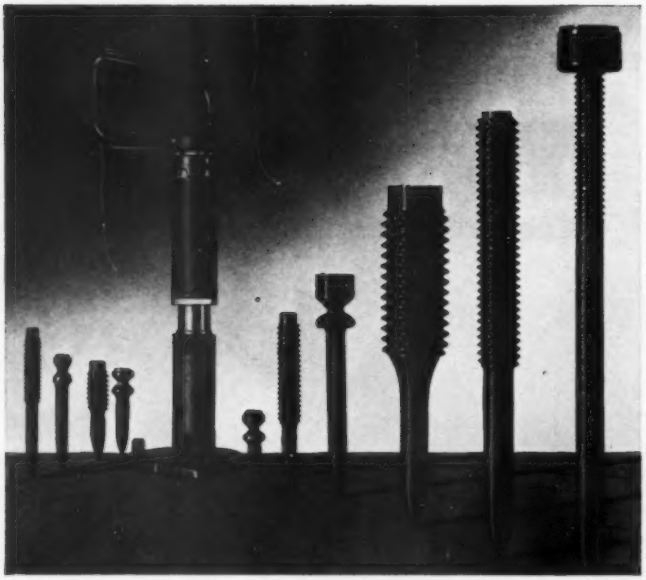
Bulletins give full information on these, and other motors in Wagner's complete line. Thirty-one branch offices, located in principal cities, are ready to assist you in any motor application problem.

Wagner Electric Corporation
1891 1951

WAGNER ELECTRIC CORPORATION
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES



HOW TO PACK 480 MINUTES INTO 1 HOUR

We're talking about the time required to do the 1000-and-1 jobs of fastening into steel, concrete, other materials, which are constantly needed for plant maintenance, alterations and new construction. The kind of work that is essential to keep production moving, yet uses up so much vitally needed man power and energy.

For instance, by old-fashioned methods, 50 such fastenings are a good 8 hours' work per man. And hard work, too. But equip the same man with the light-weight, portable RAMSET TOOL, alloy steel RAMSET FASTENERS and accurately graded power charges. He'll set 50 in an hour, under the same conditions. That's packing 480 minutes into one hour. You save precious time, the job costs far less, and because the work is so much easier, your men are happier on their jobs.

If you're not acquainted with the ease, simplicity, speed and economy of RAMSET SYSTEM, we think a 15-minute demonstration will convince you. We'll gladly do a sample job for you, and show you how to apply RAMSET to the toughest fastening work. Write us.

Ramset Fasteners, Inc., 12117 Berea Rd., Cleveland 11, Ohio

fasten FASTER with Ramset System
FASTENING SYSTEM
Pioneer in powder-actuated fastening

installations; gaseous fumes; and many others all have their individual lubrication problems.

No single lubricant will meet the diverse requirements of different machines. Yet it is a common sight to see one lubricant applied to every machine in the plant. Bearing failures will be minimized by seeing that the proper lubricant is used and that, prior to application, it is not exposed to atmospheric dust and impurities.

Another failure is the result of defective assembly procedures. Over- and under-size shafts and housings; out-of-round or tapered housings and shafts (when straight bore bearings are used); unparalleled housing seats; and others impose abnormal operating loads and contribute to early failure. Most of these conditions leave identifying marks, and if these are studied, the defective procedures may be corrected.

The modern ball bearing is of superlative quality and craftsmanship. It is designed for long years of trouble-free performance, but this can only be obtained by proper bearing maintenance. *From Bearing Maintenance Report, a publication of The Anti-Friction Bearing Distributors Association, Cleveland 15, Ohio.*

Leverage Bar

In an emergency this 3 ft steel bar can be placed between mill rolls to wedge them about 2 in. apart. Bar is curved to fit around front roll. (From Circle-News, publication of B. F. Goodrich Co.)

Floors, Vents and Tanks Contain Precious Metals

PRECIOUS METALS are being "mined" from the floor, vents and tanks at Western Electric's chemistry laboratory.

A handful of dust from a crucible looks just like plain gray ash such as you see in a fireplace. However, this is the ash of wood that had been the floor of the lab for many years. By burning the wood, the laboratory is reclaiming particles of precious metals that had become embedded in the wooden floor through the years.

In glass-lined, steam-jacketed kettles the dust will be treated to extract palladium. It will go through a color transformation as salt is added and a rust colored palladium

NOW more important than ever to you

You are, or may soon be, shifting your production setup to meet the country's rearmament needs. New machines, new operations, and faster production schedules will demand some revision of your lubrication practices. That's why Standard's Service-Supply organization is now more important than ever to you.

Standard has a service-supply warehouse within a short truck-hauling distance from your plant.

If you are a Standard Oil customer this warehouse will stock every lubricant used in your plant. Deliveries can be made in a few hours if necessary.

In addition, this service-supply center is headquarters for a Standard Oil lubrication specialist who is assigned to your plant. He is close at hand to give you help when you need it. He has plenty of practical experience. He has been specially trained for his job in a Standard Oil Lubrication Engineering School. He is backed by Standard Oil's extensive research and technical facilities.

To arrange for his visit, phone your nearby Standard Oil Service-Supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD

New, Fast, Positive Fire Killer...

DRY CHEMICAL **WHEELED PORTABLE FIRE EXTINGUISHER**

Experienced engineering develops new, highly efficient 150-pound capacity dry chemical type wheeled portable fire extinguisher . . . has exclusive design that assures you of lasting, foolproof fire protection.

This new fire killer is easy to operate, compact, well-balanced and offers extensive maneuverability indoors or outdoors. Does a highly effective job on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials . . . granted unconditional B, C rating by the Underwriters' Laboratories, Inc.

Exclusive design renders constant free-flowing dry chemical . . . fire extinguisher is partially inverted for wheeling, then fully inverted at fire scene, which changes the position of the dry chemical in the tank and thereby provides mechanical breakage. This outstanding mechanical breakage feature, plus a continuous nitrogen pressured agitation or fluffing, together with a skillfully blended free-flowing dry chemical, guarantees a faster, more effective and complete discharge.

Rechargeable on-the-scene . . . no special tools needed . . . C-O-TWO Dry Chemical for recharging packaged in handy 50-pound size, moisture-proof containers . . . spare nitrogen pressure cylinders readily available.

Act now for complete free information on this newest contribution to modern fire fighting. Remember . . . you can't put fire off . . . fire doesn't wait. Get the facts today!

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada
Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

Machine devised for stripping metal contacts from rejected parts being used to reclaim the precious metal contacts

solution results. Further color changes will take place before the powder is treated with a hydrogen flame of intense heat to make it into solid palladium. Other processes with the residue from the solutions will bring out platinum and gold.

Periodically, white powder is cleaned from the vents of the lab and precious metals extracted from it. Some time ago the precious metals section recovered more than $500 in gold from a tank, approximately the size of a bathtub, that had been used for plating.

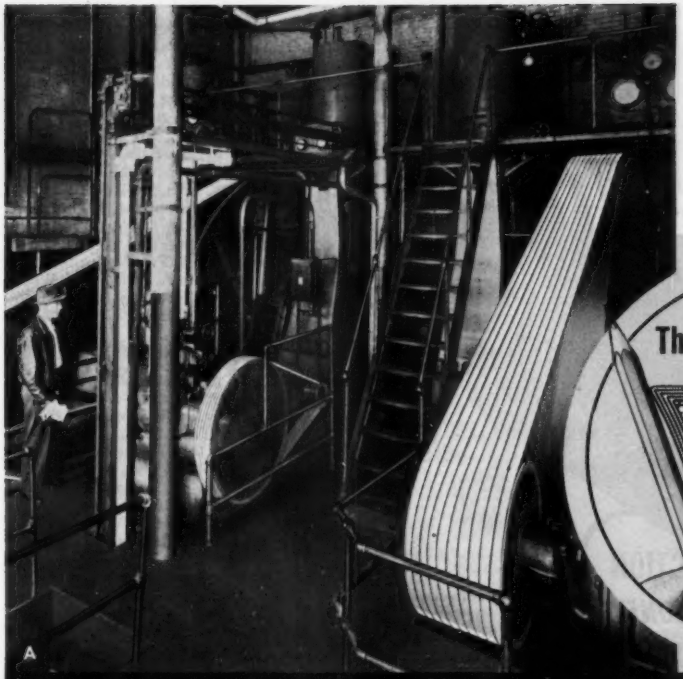
Another source for collecting precious metals is from scrap and rejected parts. Springs for relays that don't meet company standards, process scrap, bits of platinum wire picked up by a magnetic broom, and many other types of precious metal scrap yield an average of $50,000 a month. *From The Microphone, Hawthorne Works, a publication of Western Electric Co., Chicago 23, Illinois.*

For Plant Defense— Use Invisible Light

WHILE ENGINEERED protective lighting and a high level of illumination are most important for plant protection, they are not, in all cases, sufficient for detection of saboteurs or sneak thieves within the industrial plant. As a detecting aid the use of invisible light is suggested, in either short-wave radiations (ultraviolet), or long-wave radiations (infrared).

These invisible materials cannot be brushed or washed away. Documents treated with these chemical compounds make indelible marks on the user's hands, and a blacklight inspection at the plant exit tells the story. Under blacklight inspection, treated employee badges will disclose any tampering. Lunch boxes opened after lunch-period inspection, can be detected either by fluorescence or lack of fluorescence on the tape used to seal the boxes.

Proper use of infrared can aid



These big compressors of the Montana Service Corp., Butte, Montana, are driven by Gates Vulco Ropes from grooved sheaves on the motors to **flat faced flywheels.** Mr. Oscar Olson, Plant Engineer, reports excellent service from these Gates Vulco Rope V-flat drives.

This test shows how the Concave Side gives you a real saving in V-Belt costs

If you are interested in lower operating costs, make this simple test:—

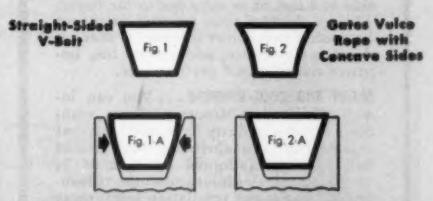
Take *any* V-belt and bend it as it bends in going around a pulley. As the belt bends, grip its sides with your fingers and thumb. You will *feel* the sides of the belt *bulge out!*

This bulging gives a straight-sided V-belt the shape shown in figure 1-A. (See diagrams at right.) Clearly, this shape does not fit the sheave groove. The sides of the bulging belt are forced to press unevenly against the V-pulley—and this concentrates the *wear* along the *middle* of the sides.

But when you bend a V-belt that is built with the *Concave Side*, you find that the sides become perfectly straight—as shown in Figure 2-A. This shape precisely fits the sheave groove.

Because there is *no bulging*, the sides of the Gates Vulco Rope always grip the *full* face of the V-pulley *evenly* and therefore wear *uniformly*—resulting in *longer belt life* and *lower belt costs for you.*

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

Only V-belts made by Gates are built with concave sides. Whenever you buy V-belts, be sure you get the V-belt with the Concave Sides—The Gates Vulco Rope!

CS-514

Gates®
Hose · V-Belts
Molded Rubber Goods
for Industry

VULCO ROPE **DRIVES**
ENGINEERING OFFICES AND JOBBER STOCKS
IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

GET EXTRA PROTECTION
—SAVE TIME AND MONEY WITH
R&M "All-Weather" Motors

What causes premature motor failure? All too often, it's *moisture!* And *condensation* within the shell can be just as bad as a cloudburst. Moisture deteriorates even the best insulation—attacks all exposed metal parts—but the damage it does *can't bother you* when you specify "R & M Motors."

WON'T RUST OR CORRODE . . . All *standard* R & M Integral Motors are now entirely "Weatherized"—completely protected, inside and out, at *no extra cost* to the buyer. They're shielded from harmful dampness by special preventive treatments that cut down maintenance, add service life, improve *overall* motor performance.

CLEAN AND COOL-RUNNING . . . You can install All-Weather Motors outdoors, without a cover—in dusty or humid locations —*anywhere!* Pre-lubricated, fully sealed ball bearings (adopted by R & M in 1939), go *years* without attention. "Clean-Sweep" *end-to-end* ventilation keeps these durable motors internally clean and cool-running.

MANY EXTRAS . . . Only Robbins & Myers gives you so many fine "extras" at the *standard* motor price. Get all the facts on All-Weather Motors today. Write for Bulletin No. 400. Please specify service or motor type. Address Dept. J-61.

ROTOR

Finished rotor is sprayed with a special rust-inhibitor which covers armature, shaft, and cadmium-plated fan used on smaller motor sizes. Larger motors have aluminum fans.

STEEL PARTS

Complete assembly of body and shell, with the stator, is dipped in "Robbinite," and this moisture-resisting undercoating—developed by Robbins & Myers—is then baked on.

CAST IRON PARTS

End-heads and terminal box are carefully cleaned and given the same anti-corrosion treatment frequently specified by our Armed Forces for use in damp climates. Painting follows.

●

Terminal box is gasketed. Leadins are sealed against leakage at shell. Repellent grease on shaft keeps moisture away from bearings. Shrouded end-heads give full-height protection.

ROBBINS & MYERS • INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

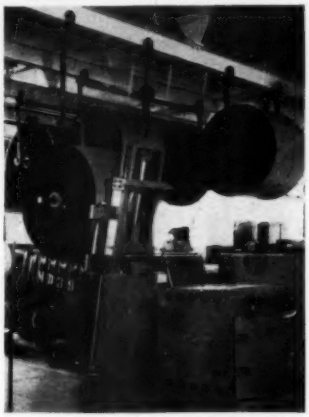
MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS

detection of saboteurs in spite of darkness — whether natural or caused by power failure. Infrared telescopes, located at strategic points through the plant, can provide all-seeing eyes for guards and watchmen by helping them to inspect shadowed areas. Also, infrared can be used as an invisible barrier in combination with photoelectric cells —when the beam is broken, an alarm sounds at the plant-protection headquarters and gives location of the intruder. *From a paper presented by Carl F. Jensen, of Westinghouse Electric Corp., at the Chicago Lighting Institute.*

Movable Mezzanine

CEILING-HUNG storage is the next best answer when no more storage space is available. Such a system was devised at Minnesota Mining and Mfg. Co. Their problem of storage involved the hanging and taking down of rolls of varying weights up to 2700 lb each and in 1200 varieties.

This was solved by using the ceiling-hung storage space. The rolls are hung on trolleys mounted on hooks which are moved along the I beams with little effort. All handling and removing of rolls is done in

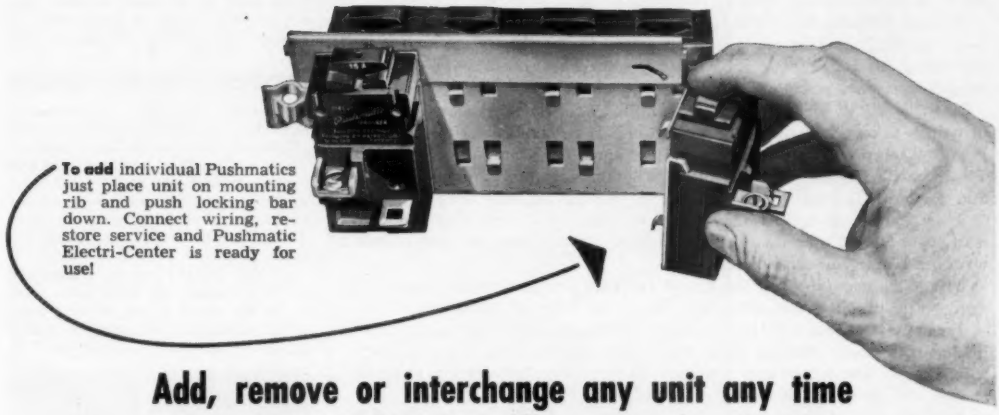


This view of the handling operation shows how any roll is easily available

the aisles which are so spaced that any roll is easily available for handling. Once hung, the roll can be moved along to the desired space.

An additional benefit of this system developed in that it was possible to continue the storage space close to the processing departments. Another important economy which figured prominently in the final savings was the practical elimination in damage loss. It became no longer necessary to unroll and discard outer edges of the expensive rolls which had been formerly damaged in handling. There was no damage to speak of. *From The Lever, a publication of Lewis-Shepard Products, Inc., Watertown, Mass.*

Meet specific panelboard needs faster with interchangeable *Pushmatics*®



To add individual Pushmatics just place unit on mounting rib and push locking bar down. Connect wiring, restore service and Pushmatic Electri-Center is ready for use!

Add, remove or interchange any unit any time for any combination of types and ratings!

NEVER before has a panelboard offered the flexibility of BullDog Pushmatic Electri-Centers!

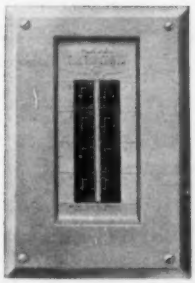
Pushmatics are the same size, regardless of rating or type, and are completely interchangeable. Any Pushmatic can be installed at any point on the mounting rib. Pushmatics can be added to the Electri-Center faster, more economically and with less confusion.

Exclusive push-button switching, too!

PUSH . . . it's on! PUSH . . . it's off! PUSH . . . it's on again if circuit is broken by short or overload. Pushmatic offers the simplest switching available anywhere. No complicated resetting to fuss with . . . no fuses to replace.

And you can meet any load condition with these Pushmatics: Standard Thermal MAGNETIC and Thermal ULTRA-MAGNETIC, the latter available with or without BullDog's exclusive AMBIENT COMPENSATING FEATURES. Ratings of 15, 20, 30, 40 and 50 amperes, 1 pole, 120 V., or 2 poles, 120-240 V., A.C.

Now investigate Pushmatic Electri-Centers . . . the finest panelboards on the market.



Handsome BullDog Pushmatic Electri-Centers are available from 2 to 42 circuits. Pictured: 8-circuit Service Equipment Type. Plenty of wiring room even in smallest Electri-Centers for easier installation.

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

With This NEW Improvement Niagara "No-Frost Method" puts you a big step ahead in trouble-free, automatic refrigeration or freezing

Niagara "No-Frost Method" keeps frost and ice COMPLETELY OUT of your cooling, chilling, freezing or cold storage.

It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity NEVER cut down by ice building up progressively on refrigeration coils.

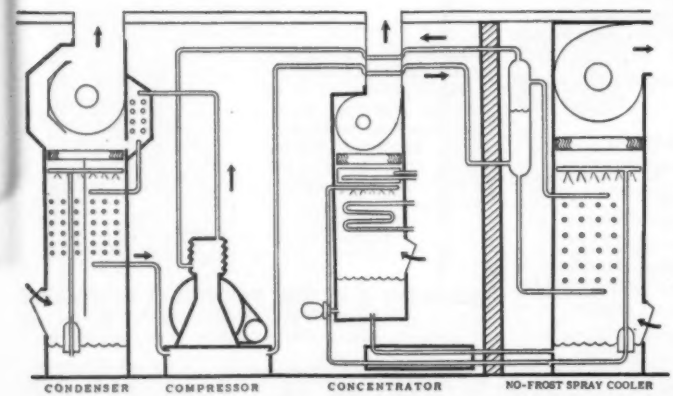
Now, a NEW design No-Frost Liquid concentrator, using a new principle, takes away moisture as fast as it is condensed by evaporating it at low temperature — not boiling it away at high temperature. It has 14 times the capacity of the old method per dollar of investment — one concentrator will handle a battery of high capacity spray coolers.

This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use — both for freezing and for moderate temperatures — for large "live" loads as in meat chilling or in fruit and vegetable pre-cooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

For complete information write to the Niagara Blower Company, Dept. PE, 405 Lexington Avenue, New York 17, New York.



A simple method, easily maintained. Saves a third of your refrigeration cost. Ask for Niagara Bulletins 118 and 119.

Wet Weather Plastering

DURING THE wet season of any year weather conditions often cause "sweat outs" on plaster jobs. To prevent a sweat out, the walls should be dried out as quickly as possible after the plaster has set. Doors and windows should be opened to provide ventilation and will help speed the drying.

In extremely cold, damp weather, the rooms should be heated and again plenty of ventilation should be provided. If this is not done, and the plaster is allowed to remain damp, the gypsum plaster loses strength and will have a damp, musty odor.

The finish coat of plaster should never be applied until all the excess water has been removed and the base coat is at least surface dry. *From This Earth, a publication of Henry J. Kaiser Co., Oakland, Calif.*

Permanent Anchorage in Concrete

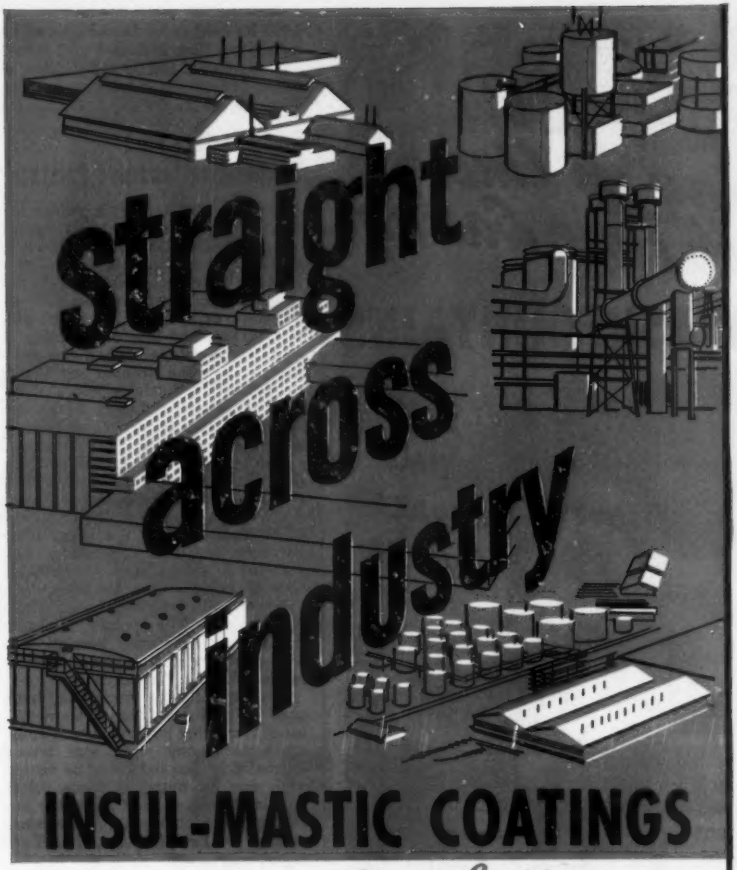
FASTENING OBJECTS to concrete, stone or brick facings can be accomplished by the use of Cinch anchors. These are rings of lead and iron and come in many sizes and several types to accommodate bolts required for anchoring anything from a backyard clothesline to mooring posts for giant liners.

In the installation at Aluminum Co. of Canada plant, gear units were to be anchored to an existing concrete foundation. Holes were drilled in the concrete to a depth of 2 ft.

Anchorage in place to handle heavy duty rolling mill gear unit. Three Cinch anchor units are shown at right

Stud bolts 2½ in. in dia, threaded at one end and with 2 in. steel collars welded to the other end to provide heads for the anchoring units, were placed in the holes in the concrete. Four anchor units, each consisting of a conical-wedge iron ring and a lead alloy ring, were placed, one at a time, around the stud bolts and each calked in turn to refusal.

After all bolts were positioned and calked in the concrete foundation, a length of sway pipe was placed around each bolt and 2 ft more of fresh concrete was poured. After this was well set, grout was run in around the bolts to fill the holes completely to the top of the concrete. The gear units, which will drive a



SIGNIFY *Simplicity*

Insul-Mastic is the simple, practical coating for corrosion prevention, insulation, moisture and vaporsealing. Here is *lasting* protection without complicated or multi-coat application methods. One coat quickly sprayed onto a clean dry surface gives you a heavy barrier against weather and chemical attack. Insul-Mastic's simplicity means economy for you.

Insul-Mastic is top quality protection against acids, alkalis, moisture-vapor and other corrosive agents. Masonry and insulation can also be protected from moisture by this Insul-Mastic seal. Insul-Mastic Type "D" offers thermal insulation (−40° to 300° F.) as well as protection.

Write for complete information and the name of our nearest representative.

Think first of the coatings that last!

NO SPECIAL PREPARATION

A clean dry surface—a primer maybe—but no special preparation for Insul-Mastic.

NO MIXING

Insul-Mastic is homogenized. Solvents don't separate from the coating.

NO HEATING

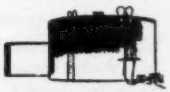
Insul-Mastic coatings are sprayed just as they come from the drums.

SPRAY APPLICATION

No specialized application methods are needed for Insul-Mastic coatings.

NO HARM TO WORKMEN

Fumes do not burn eyes or skin.



ONE COAT APPLICATION

One coat of Insul-Mastic is sufficient for lasting protection.

NO SPECIAL CURING METHODS NEEDED

Spray Insul-Mastic and leave it.

Insul-Mastic Corporation
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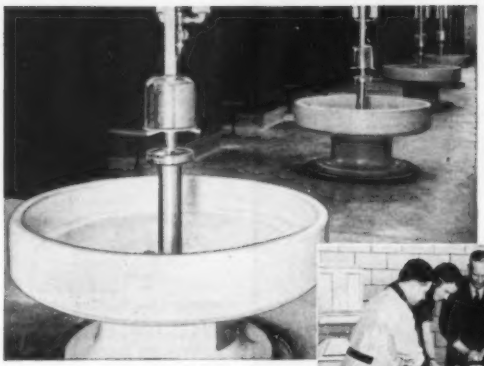
1163 OLIVER BUILDING · PITTSBURGH 22, PA.
Representatives in Principal Cities

No Waiting in Line with Time Saving

BRADLEY WASHFOUNTAINS



SAVE TIME SPACE WATER

• Many plants still lack adequate wash facilities. If additional equipment is needed in your plant, investigate the many advantages of Bradley Washfountains.

Easily installed, with only three piping connections, each Washfountain serves 8 to 10 workers simultaneously. Automatic foot-control plus self-flushing bowl and easy-to-clean single sprayhead assure utmost health protection. Maintenance is kept to a minimum, water economy realized, and employee morale improved, with efficient, convenient Bradleys.

The Standard for 30 Years

During the past 30 years, Bradleys have become established as the standard for factory washrooms. Original installations can be augmented at any time—we'll be here to furnish you with complete equipment, replacement parts, or service. BRADLEY WASHFOUNTAIN CO., 2371 W. Michigan Street, Milwaukee 1, Wisconsin.

Distributed through Plumbing Wholesalers

BRADLEY washfountains

As a guide to washroom planning, write for our illustrated Catalog 4701 today.

1,000 hp cold sheet four-high rolling mill, were then installed and bolted down. *From Lead, a publication of Lead Industries Association, New York 17, N. Y.*

Brush Surface With Temperature-Sensitive Paints

TEMPERATURE-SENSITIVE paints indicate by a sharp, clear cut change of color when the temperature of a surface has attained or exceeded a predetermined value. The paints are suitable for direct application by brushing or spraying to practically any surface and will dry quickly at room temperature. When the temperature of the treated surface is then raised, the original color of the pigment changes sharply at a definite point and the new color persists after the surface has cooled down.

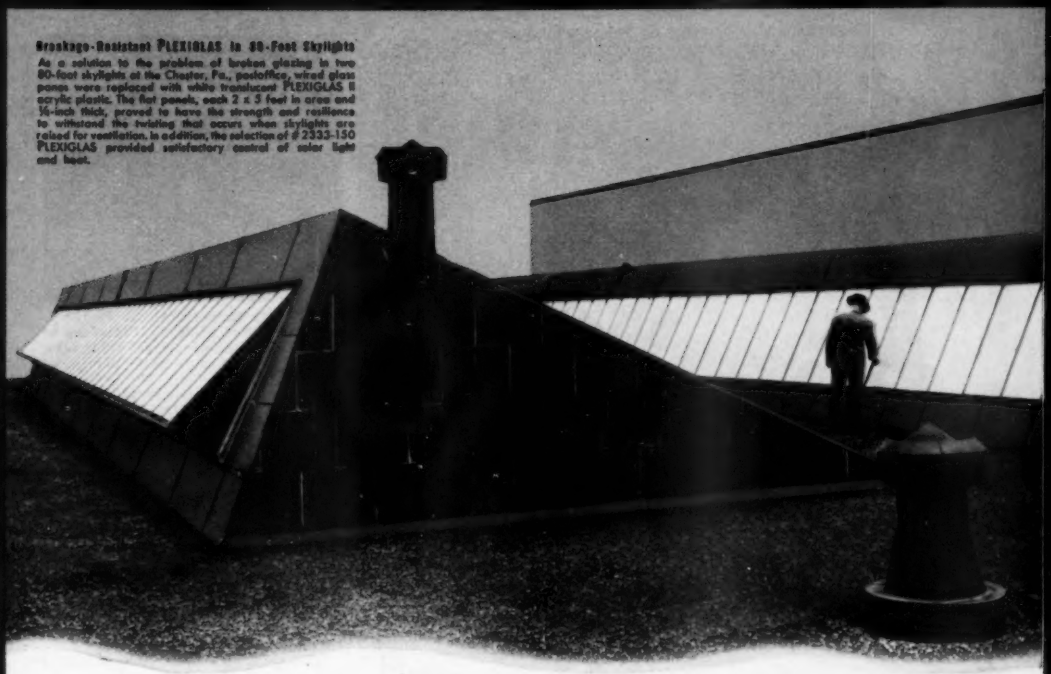
The application of these Thermindex paints are wide and varied. They can be used as indicators in processes which require molds or rollers to be preheated to the same temperature for each operation, and provide a simple and inexpensive way of safeguarding bearings, motors, circuit breakers, etc., from overheating. The paints facilitate the detection of faulty insulation of high-pressure steam pipes and burners which have "struck back."

For experimental work, they have good possibilities since intricate surfaces or moving parts on which elaborate measuring equipment would normally be required can be coated with one or more of these colors and isotherms plotted from the resulting color changes. *From a news release for Tempil Corp., New York 11, N. Y.*

Lift-Bridge Cuts Freight Handling Costs

THE LOADING operation at the Atlanta Freight Station of the Southern Railway System required some means of moving the freight between platforms. The time to go around the ends of the outbound tracks was too costly, so it was decided to use removable bridges

Fig. 1. Lift-bridge in loading position. Motor drive for raising and lowering bridge is seen at side of lift bridge, under floor of loading platform, arrow



Breakage-Resistant PLEXIGLAS in 80-Foot Skylights
As a solution to the problem of broken glazing in two 80-foot skylights at the Chester, Pa., postoffice, wired glass panes were replaced with white translucent PLEXIGLAS II acrylic plastic. The flat panels, each 2 × 5 feet in area and ¼-inch thick, proved to have the strength and resilience to withstand the twisting that occurs when skylights are raised for ventilation. In addition, the selection of # 2332-130 PLEXIGLAS provided satisfactory control of solar light and heat.

PLEXIGLAS

For Replacement of Troublesome Glazing

Flying objects and sudden impacts aren't the only enemies of industrial glazing. Excessive cracking and breakage often occur when long heavy skylights are cranked open or shut—when walls settle—or when rusty sash warps, twists, and binds.

Remedy:—PLEXIGLAS II, heat-resistant acrylic plastic. This tough, light material has the strength and resilience to withstand considerable torsion, as well as heavy wind loads and hard blows. In high-breakage areas, it has time and time again proved its ability to cut replacement costs to the bone.

PLEXIGLAS solves other glazing problems, too. Because it is breakage-resistant and less than half as heavy as glass, you can erect it with little or no framing. And its availability as clear or translucent material in flat or corrugated form, its formability, and resistance to weather, adapt it to many glazing applications—from skylight and sidewall glazing in factories to curved display windows in modern stores. Full details of PLEXIGLAS for glazing are yours on request.

CHEMICALS FOR INDUSTRY

* A steadily increasing percentage of PLEXIGLAS production, now at record levels, is required for the defense mobilization program. The supply available for civilian applications is limited.

PLEXIGLAS is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.

Canadian Distributor: Crystal Glass & Plastics, Ltd.
54 Duke Street, Toronto, Ontario, Canada.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

JEFFERSON FUSES Act Positively on Dangerous Overloads . . . . .

• Save costly and needless blowing of fuses by specifying Jefferson SAF-T-LAGS. This is a Fuse so accurately calibrated and job-rated that *harmless* overloads of short duration cause no reaction while POSITIVE PROTECTION is immediately provided should excessive and damaging overloads occur.

You minimize production delays and work stoppages with Saf-T-Lags because they will not shut down a circuit unless absolutely necessary. Yet you always have full protection on heavy overloads and short circuits. Saf-T-Lags also provide THERMAL protection to panel boards and switching equipment thus avoiding damage caused by poor contact, insufficient air or poor heat dissipation. Furthermore, with Saf-T-Lags you are safeguarded against motor burn-outs due to single phasing of polyphase motors.

Approved by Underwriters' Laboratories, Inc.

For the complete story on Saf-T-Lags send for Folder 482-ST.

JEFFERSON THERMAL JEFFERSON ELECTRIC **SAF-T-LAG FUSES**

JEFFERSON ELECTRIC COMPANY • Bellwood, Illinois

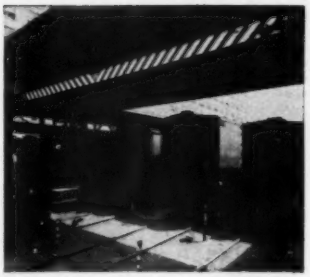


Fig. 2. The three-track lift bridge is shown in raised position. Clearance of 18 ft is provided above railroad tracks. When lowered, bridge rests on supports

placed across the tracks at the center of the long platforms.

Electrically-operated steel lift bridges were installed to move freight across tracks and into box cars to be loaded. Each bridge platform is raised very simply by pressing a button. This starts the motor drive, which pulls up the platform by means of steel lift cables reeved around sheaves at top of bridge columns and around a rope drum at the ground line. Highest position of bridge provides for a clearance of 18 ft above railroad tracks.

Savings have also been realized through less damage to cargo during rainy weather. This was accomplished by placing a permanent roof over each lift bridge. Some man-hours of working time are also utilized since the men can continue loading operations during inclement weather. *From Link-Belt News, a publication of Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.*

Flushing Sprinkler Systems

ANY MATERIAL accumulation of foreign matter in sprinkler piping may constitute a serious impairment of protection. Parts of a sprinkler system may be entirely clear of foreign material while dangerous deposits may exist elsewhere due to arrangement of piping and source of foreign material.

When there is reason to suspect the presence of foreign material in a system, the condition of the overhead sprinkler piping should be determined by test-flushing of the small end lines through hose and by examination of the piping by disconnecting at strategic points.

The first step in flushing sprinkler systems is to thoroughly clean and flush the water supplies and underground piping. In general, there are two principle methods of cleaning interior piping: the hydro-pneumatic method and water flushing. In both, a stream of water passing through the pipes with sufficient force raises the loose foreign material in suspension and carries it out of the system. Cleaning opera-

(Continued on page 40)

C. L. ETCHISON, of EVEREDY COMPANY, SUBMITS WINNING IDEA IN CONTROL DERBY

Mr. C. L. Etchison, Superintendent of Metal Finishing at the Everedy Company of Frederick, Maryland, comes up with a control system using two Honeywell products, installed at a total cost of less than $200, that effected total savings of $4300 a year. Mr. Etchison won a Honeywell Electric Clock Thermostat for telling about the application.

The control, which is installed over automatic nickel plating conveyors, consists of a solenoid valve operated by a switch manufactured by Honeywell's Micro-Switch Division, causing water to flow through a series of misting nozzles.

The idea is to spray the freshly plated objects with a fine mist of water when they are lifted into the air from the nickel plating bath, so that a minimum amount of nickel plating solution will be dragged out of the plating tanks.

Every day, many thousands of gallons of nickel solution at 75c a gallon are being wasted throughout the country by "drag-out." The object was to salvage this wasted solution by washing it off the plated objects.

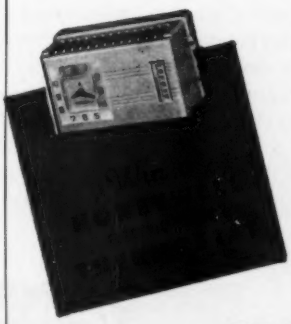
The switch is tripped by the conveyor as the work is raised from the plating bath. The spray is on for a very short time, so no water is wasted, and the small amount of water which is added to the plating bath does not weaken it, since it just about makes up for evaporation. The adoption of this simple system saved $2500 a year on one conveyor, and $1800 a year on the other by practically eliminating "drag-out."

Honeywell Solenoid Valve

NEWSPAPER FOR PLANT ENGINEERS ANNOUNCED

Honeywell's Industrial Division now has a monthly publication—Industrial Control News—which contains detailed information on many new and unusual applications for automatic controls throughout industry. In its pages, production and maintenance men tell how they are reducing costs and increasing operating efficiency on all types of equipment. According to a recent release from the company, anyone interested in industrial controls can contribute to *Industrial Control News* . . . and can receive copies . . . by sending name, company, title and address to MINNEAPOLIS-HONEYWELL REGULATOR CO., Station 70, 4491 Wayne Ave., Philadelphia 44, Pa.

do you have an [redacted] for the HONEYWELL INDUSTRIAL CONTROL IDEA DERBY?



Just send us a sketch and description of how a non-indicating control is now being used to help keep things running smoothly in your plant. Think about it! Then send it in! An impartial board of judges will rate it in terms of its importance to the maintenance of plant operations. You may win a Honeywell Electric Clock Thermostat!

All material submitted becomes the property of MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 4491 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

Brown Instruments

Announcing...
THE NEW
CANTON TURBO-AIRE
OVER-FIRE AIR SYSTEMS
BURNS ALL THE FUEL— INCLUDING THE SMOKE
DIRTY SMOKY FIRE CAUSED BY INCOMPLETE COMBUSTION
CLEAN FIRE, COMPLETE COMBUSTION with TURBO-AIRE

Diagrammatic views showing the difference between incomplete combustion, and the clean hot fire and total combustion made possible with TURBO-AIRE.

Here is your low-cost answer to higher combustion efficiency and elimination of the smoke nuisance!

By an extremely simple and highly efficient method, TURBO-AIRE injects a high air turbulence into the combustion area above the fire bed. This breaks up the direct draft to the flue and stack, supplying additional oxygen and keeping the partially burned volatile materials and gases in the high-heat area until maximum combustion has been obtained.

By this simple proven scientific principle TURBO-AIRE insures maximum combustion of the fuel used, with more heat per pound of fuel burned, elimination of smoke and soot, and cleaner flues and stacks.

Improve the efficiency of YOUR plant with low-cost TURBO-AIRE. Its operation in your heating or power equipment will quickly prove a profitable investment.

Full information on TURBO-AIRE and its advantages may be had by sending the attached coupon to CANTON STOKER CORPORATION, Andrew Place, S.W., Canton 1, Ohio.

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Andrew Place, S.W., Canton 1, Ohio
Please send your technical bulletin on TURBO-AIRE.

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COMPANY _____
ADDRESS _____

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CANTON STOKER CORP.
CANTON 1, OHIO

BULLETINS just released and of immediate plant interest

ELECTRICAL AND LIGHTING

101 Weatherized Motors—Six-pp Bulletin 400 describes company's All-Weather integral motors for industrial use. These motors have full height protection, through ventilation, one-piece steel shell and interchangeability of end head. These and other features are pictured; pre-lubricated bearings discussed. Robbins & Myers, Inc.

102 Instrument Transformer Catalog—A well-illustrated, 93-pp brochure, GEA-4626, gives buying information on company's instrument transformers. The publication is divided into sections offering technical data on indoor and outdoor potential transformers, current transformer, metering outfits, potential and current portable transformers. Listings of ratio and phase-angle tests, coupled with tables covering mechanical and thermal limits of current transformers are included. Meter and Instrument Divs., General Electric Co.

103 Indent-Type Electrical Connectors—Hydent Catalog T33, 28 pp, describes company's line of solderless electrical connectors and installation tools for industrial and manufacturing use. Also gives full instructions for selecting them, according to a simple tool index system developed for ordering tools and components. This easy-to-read index shows which tools can be used for installing each connector size and the proper dies for tool selected. Advantages of Hydenting are detailed. Burndy Engineering Co., Inc.

104 Testing Instruments—Three low cost Megger electrical resistance testers are described in 8-pp illustrated Bulletin 31-85-15. Covers a midget insulation tester, a constant voltage type and a midget circuit testing ohmeter, giving specifications, facsimile scales. Includes current price list. James G. Biddle Co.

105 Buyers' Guide on Testing Instruments—Sixteen-pp Bulletin GEA-5469 covering electrical testing instruments introduces the new hook-on power-factor meter for measuring power factor quickly without interrupting service and is especially designed for use in industrial plants. Other instruments pictured and described as to characteristics and applications include hook-on volt meter, hook-on ammeter, portable recorders, indicators, resistance meter and tachometer. Prices are given, instrument selection chart included. Meter and Instrument Divs., General Electric Co.

106 Fluorescent Lighting Equipment — Bulletin mf provides 20 pp of information specifications and mounting data on lighting equipment for Slimline fluorescent lamps. Covers individual units, accessories, continuous line systems, suspension fittings. Benjamin Electric Mfg. Co.

107 Aeronautical Obstruction Lighting—This booklet (Supplementary Sections 9 and 10 to Catalog 50) contains 36 pp of information on use of disconnecting and lowering hangers with fixed position aeronautical obstruction lights. Utilizes more than 30 photos and diagrams to show typical installations of hangers and two-gang obstruction lights and 300 mm code beacons developed for use with them. Installations on smoke stacks, radio towers, water tanks, grain elevators and other structures to 400 ft in height are covered. CAA requirements for lighting of structures considered hazardous to aircraft are listed. Also included are installation instructions, tables of material requirements and sources of supply. The Thompson Electric Co.

INSTRUMENTS, CONTROLS

108 Combustion Safeguard Manual — Catalog 9601, 32 pp, is actually a complete handbook on flame failure protection for industrial applications. Includes information on new "flame-rectification principle" of operation, descriptions of many types of system components, installation drawings, bills of material, comprehensive information on 34 safeguard systems. Current price list enclosed. Industrial Div., Minneapolis-Honeywell Regulator Co.

109 Temperature Control Instruments—Generously illustrated 12-pp Catalog 10 provides a useful aid in the selection of precise and reliable temperature control and regulating instruments. Equipment described includes thermo-regulators of various types and thermostats, relays for multi-contact thermo-regulators. H-B Instrument Co.

110 Flame Failure Safeguard — Bulletin CP311, 8 pp, describes a flame scanning tube designed to "see" all types of flames and give instant positive response to flame failure. The tube is a photo-conductive cell highly responsive to infra-red, and is designed for continuous use at high (250 F) temperatures and unusual conditions of humidity and vibration. Its use with company's combustion control systems is discussed and specifications and dimensions given. Combustion Control Corp.

111 Electro-Chemical Measurement — Technical Bulletin B51-2 is a 24-pp illustrated text on fundamentals of industrial electro-chemical measurements and automatic control. In it the measurement of pH, redox and conductivity in industrial control systems is comprehensively covered and basic principles of electro-chemical measurements as well as final control elements for automatic control systems are included. Industrial Div., Minneapolis-Honeywell Regulator Co.

112 Sight Feed Bubbler—This 2-pp illustrated bulletin gives construction details, dimensions and specifications on a sight feed bubbler for gas and air lines to indicate small rates of flow. Includes similar data on a sediment trap for collecting dirt and moisture from gas or air lines. King Engineering Corp.

113 Electronic Operator — Illustrated Form SMS, 2 pp, describes an electronically controlled, fully automatic power unit for operations requiring a reversing travel cycle—doors, gates, grilles, partitions, conveyors—for which 10 different 12-v remote controls are available. Discusses possible mechanical and electrical variations. Explains features, gives specifications. Robot Appliances, Inc.

114 Electric Potentiometers—Catalog 15-15, 30 pp, covers company's Electronik electric control potentiometers for both contact and proportional control applications. Fully illustrated with photos and diagrams it explains operating principle and advantages of the instruments. Provides engineering and constructional data, describes types of control, includes a partial list of available ranges and presents accessories. Industrial Div., Minneapolis-Honeywell Regulator Co.

PIPING AND VALVES

115 Piping Fabrication and Erection—To demonstrate manufacturer's experience and facilities for fabrication and erection of industrial piping, 24-pp Bulletin 1700 presents a pictorial review of piping installations in steel mills, for gas transmission system, central power stations, water pumping stations, heating plants, oiler refineries and chemical process plants. Engineering and fabrication facilities are also described. Dravo Corp.

116 Piping Pointers—This is a new 36-pp edition of company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 40 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide to aid in selecting valves for common piping services. (Company also offers showings of a 30-min 16 mm film for use with manual in training beginners and refreshing veterans in industrial piping crews. Information about this film available to plant engineers who request it.) Crane Co.

117 Pre-Fabricated Piping — Bulletin WP1, 8 pp, discusses advances in the field of high and low pressure piping subassemblies. Describes and pictures pipe bends, coils, headers, manifolds, Vansome work, process piping, and welded assemblies. Also described are facilities for fabricating jobs from carbon steel, carbon moly, all alloys, stainless steel piping. Western Piping Supply Div., The Lummus Co.

118 Safety Head Catalog—Section 10, Part 1 of Catalog 54 offers 32 pp of informative reading on safety heads. Fully illustrated with cutaways and installation photos, it contains charts and tables covering almost any phase of safety head information desirable. Tells where safety heads can be used and how to use them. Gives advantages of manufacturer's line in protecting pressure equipment. Tells how to choose safety head assemblies and rupture discs. Includes tips on lowering temperature at point of safety head location. Black, Sivalls & Bryson, Inc.

119 Piping Layout Manual — Practical Piping Layouts 25-50 is a 26-pp collection

June, 1951

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PLANT ENGINEERING

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of basic piping layouts, with valve recommendations, covering a wide range of industrial setups — an automatic sprinkler system tank connection, oil burner piping for light oils, central pumping station for transfer of fluids. Design fundamentals and applications of company's valves are also explained, illustrated. Jenkins Bros.

120 Chemical Resistant Plastic Pipe — Complete engineering data on tubing, pipe, valves and fittings of company's Ace-Saran and Ace-Parian polyethylene plastics are given in this 16-pp illustrated catalog. Contains tables of properties and tables of resistance of these lightweight, tough plastics to a long list of common chemicals. Also gives bursting and working pressures, standard sizes and weights; offers information on fabrication of complete systems from these new plastics. American Hard Rubber Co.

121 Power Operated Valves — Providing excellent information on pneumatic-hydraulic and electric power operated valves, 44-pp Bulletin V-214 tells advantages of power operated valves and explains how manufacturer's valve design is especially applicable to power operation. Illustrated engineering data is provided on five types of operators—non-automatic, automatic and lever cylinders, and electric and pneumatic motor operators—covering installations, mounting, control equipment required. Included chapter on automatic lubrication of these valves by means of company's Hypermatic lubricant. Rockwell Mfg. Co.

122 Valves for Viscous Liquids—Illustrated Bulletin W-404-B4 presents manufacturer's Rollo valves for use with viscous liquids and liquids with solids. Explains unobstructed flow, reduced turbulence, reduced wear, other advantages. Describes and pictures some examples of use. Worthington Pump & Machinery Corp.

123 Valve Specialties—Included in 90-pp Catalog A-50 is complete ordering and engineering information on automatic pressure flow and liquid level controls for steam, air, gas, water, oil and other liquids. Sections are devoted to pressure regulators, altitude valve, pump governors and strainers; lever, float and motor operated valves, pilot valves; back pressure, relief and non-return valves, steam trap and air vent; liquid level controllers; solenoid valves. There's also a section on technical data providing capacity charts. Davis Regulator Co.

124 Pipe Tool Operating Guide—Form O.G. is a concise 4-pp folder prepared to help users get best results from portable pipe and bolt machines and hand pipe tools. It's illustrated with simple drawings and tells quickly how to locate and correct pipe machine and hand pipe tools troubles. In all, 31 operations are covered. Main sections are devoted to threading, cutting, reaming, driving geared tools, oil pump, and electrical data, and care of dies. Beaver Pipe Tools, Inc.

PUMPS AND COMPRESSORS

125 Pump with Pendulum Action—A new and rugged hydraulic pump, the Hydramite, capable of delivering to 5000 psi is introduced in Form S2544. Nine major advantages are discussed briefly and applications given. Includes performance charts, explanation of how pendulum action prolongs pump life and cuts maintenance costs. American Engineering Co.

126 Pump Controls—Bulletin 1210 describes pressure operated pump controls for elevated tank systems using two or more pumps, showing how company's system offers simplified liquid level control, reduced pump operation, other benefits. Fully illustrated, describes features, pump operation, protection afforded and possible modifications. Sequence of operation is also detailed. Automatic Control Co.

127 Rotary Positive Gas Units—Sixteen-pp Bulletin 32-33-B-13 presents rotary positive gas pumps, discussing their advantages, limitations and applications. Operating principle of pumps is explained and illustrated and four models pictured and described, as are gears and bearing details. Includes photos of ten installations. Also discusses regulators and control systems. Roots-Connersville Blower Corp.

128 Refrigeration Compressors—Detailed description of 2, 3, 5 and 7½ hp hermetically sealed refrigeration compressors and condensing units is given in 8-pp Bulletin DB 101-110. Construction features of company's Types CLS-74, -110, -138 and -228 compressors and condensing units are described in detail and illustrated liberally. Specification data included. Sturtevant Div., Westinghouse Electric Corp.

129 Vacuum Calculator — Now available without charge to plant engineers is a slide rule for quick calculations in vacuum research and processing work. It determines needed pump capacity to evacuate a given volume to a specified vacuum in a given time, and time required to reach a specified vacuum in a given volume with a pump whose capacity is known. Also determines vapor pressures of water at various temperatures and capacities of round tanks in both cubic feet and gallons per foot. On the reverse side of the rule are conversion tables including a Centigrade-Fahrenheit graph and chart showing boiling points of solvents under pressure. F. J. Stokes Machine Co.

MECHANICAL POWER TRANSMISSION

130 Roller Chain Drives—Catalog RS-50 is a 28-pp manual and ordering guide on company's stock roller chains and sprockets. Includes dimensions on standard chain and attachments, sprockets of ⅜ to 2 in. pitch, flexible couplings for roller chain, and conveyor chains. Includes discussion of advantages of roller chain drive and construction features of line. Whitney Chain Co.

131 Blocks and Sheaves—Catalog 300-24, 24 pp, covers manufacturer's complete line of blocks and sheaves. Provides block number, capacity in tons, number of sheaves, rope size and weight of each block. Illustrations, ratio table and formula included in a section on figuring line parts, are intended to make reeving and line part figuring easy for riggers. Compiled for easy ordering, related items are grouped together in this catalog and specifications easy to understand. American Hoist & Derrick Co.

132 Improved Drive—Sixteen-pp Catalog C 72-51 introduces manufacturer's Hy-Vo drive designed for maximum load carrying ability at both high and low speeds. Explains and illustrates how this new drive's principle of joint articulation and tooth engagement greatly reduces chordal action. Other advantages—lower operating temperature, reduced vibration and noise and higher speeds—are described. Includes Hy-Vo chain data, service factors and capacity ratings. Discusses drive's simple installation, lubrication. Morse Chain Co.

MATERIALS HANDLING

133 Got a Handling Problem?—Lit SH-7 is a special engineering folder for industrial users of lift trucks who face unusual handling problems. Illustrates many of company's Towmotor devices specially designed to grip, clamp, grab or support almost any type of load, and lift, transport, unload, deposit, dump, upend or revolve it. These are custom-engineered developments, not standard items, but they show solutions to special problems and represent special combinations of standard accessories, special load-supporting mechanisms, and other non-standard equipment. Towmotor Corp.

134 Automatic Dispatch Systems—Bulletin AD-1 is a 12-pp illustrated discussion of automatic dispatch systems for company's MonoRail equipment. Describes simplicity of operation and explains functions—dispatch between two stations, to single or multiple stations, selective dispatch and load and delivery between two and multiple stations. Standard, special and remote controls are described, applications of various systems pictured. The American MonoRail Co.

135 Data on Tramrail Equipment—Twelve-pp Form 2006F is a recently revised booklet of engineering and application data on manufacturer's tramrail systems. Tells what an installation can do toward improving plant handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

136 Electric Hoist—Bulletin 300 introduces company's Series 700 Load Lifter electric hoist, which incorporates many modern design features and can be serviced without being taken down from track or support. Includes specifications for single-speed, double-speed models of 1000- to 5000-lb capacity. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

137 For Problem Handling Jobs — This illustrated folder presents the Rol-A-Lifts —twin handling devices with hydraulic jack action and full swiveling casters. They are designed to handle crates and materials too bulky for a fork truck, and to move them into tight places inaccessible to most overhead equipment. Gives specifications on models with capacities of 700 to 8000 lb per pair. Photos show how lifters are operated and what they can do. Skarnes Engineering and Supply, Inc.

138 For Easy Maneuvering—Two-pp Bulletin 1537 describes and illustrates a new 2000-lb capacity fork lift truck featuring shorter width, length and turning radius as well as other design improvements, and available in 24- and 15-in. load centers. Operating data and specifications included. The Buda Co.

(Continued on page 111)

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Take a "BIG BITE" out of Power Costs

Put cost-cutting teeth in your V-Belt drives with DAYTON COG-BELTS*

★ 40% MORE H. P. PER BELT ★ FEWER BELTS
★ FEWER PULLEY GROOVES ★ LONGER BELT LIFE

Costs of power transmission come tumbling down with the premium Dayton Cog-Belt. Original cost is less. 5 Dayton Cog-Belts with rayon cords do the work of 7 ordinary V-Belts.

You save drive space. Cog-Belts let you use shorter center-to-center pulley distances — as much as 25% shorter.

Cogs are the only V-Belts scientifically built to bend, like your finger. They withstand flexing and compression strains better, run cooler, last longer.

To save money and drive space, get Dayton Cog-Belts. Ask your Dayton Distributor.

"Cog-Belts on the ball!" says Maintenance Man

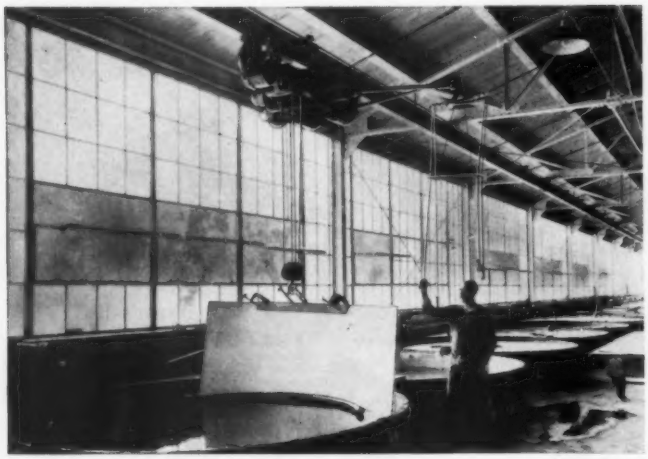
Swedish ball grinders were chewing up steel cable V-Belts in 4 to 5 weeks. Reasons: small motor pulleys, and oil. Dayton BX60 Cog-Belts were tried on one machine, *more than doubled* best previous belt life. Now Cogs drive all the ball grinders. "Cogs are really on the ball!" says the company engineer.

DAYTON RUBBER COMPANY, DAYTON 1, OHIO

V-Belts by **Dayton Rubber**

*T. M.

WORLD'S LARGEST MANUFACTURER OF V-BELTS



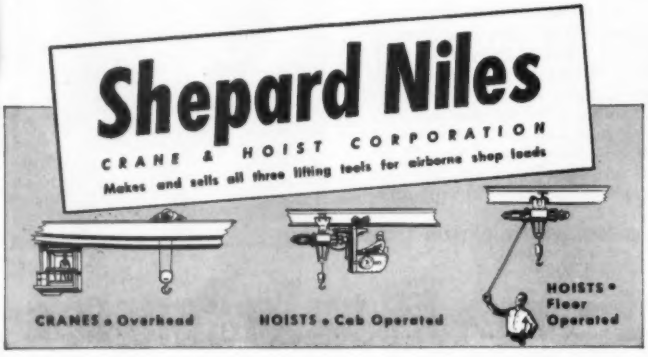
How to keep a hoist from growing old before its time!

The time to add years to the life of your hoist is *before you buy it!*

You can do this and avoid costly production slow-downs later if, before you buy, you estimate what the maximum and average loads are to be; how frequently your hoist will be called upon to handle those loads within a given period.

You will also want the answers to these questions: What distance is the load to be lifted and lowered, and at what speeds? How quickly must the hoist travel from one location to another to keep production at top efficiency? What temperatures are likely to prevail? Are there any corrosive influences? . . . and many others.

You can save your time now, and considerable trouble later, by asking a Shepard Niles specialist to study your problem and recommend the most economical hoist for you—in terms of your own specific operations. We invite your inquiries.


Shepard Niles
CRANE & HOIST CORPORATION
Makes and sells all three lifting tools for airborne shop loads
CRANES • Overhead
HOISTS • Cab Operated
HOISTS • Floor Operated

474 SCHUYLER AVENUE • MONTOUR FALLS, N.Y.

(Continued from page 34)

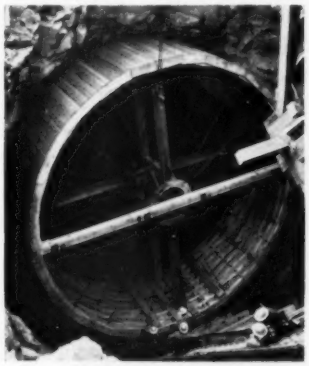
tions should, preferably, be done by an automatic sprinkler contractor.

Cleaning of a sprinkler system involves major interruptions of sprinkler protection. The insurance carrier should be notified before work is started.

Care should be taken to make sure that as little as possible of the sprinkler equipment is out of service at one time. Provision should be made to restore protection fully at the close of the day's operations after work on the system is stopped. Stationing special watchmen at closed valves so that they may be opened in case of emergency, is a proper precaution. *From Sentinel, a publication of Factory Insurance Association, Hartford 2, Conn.*

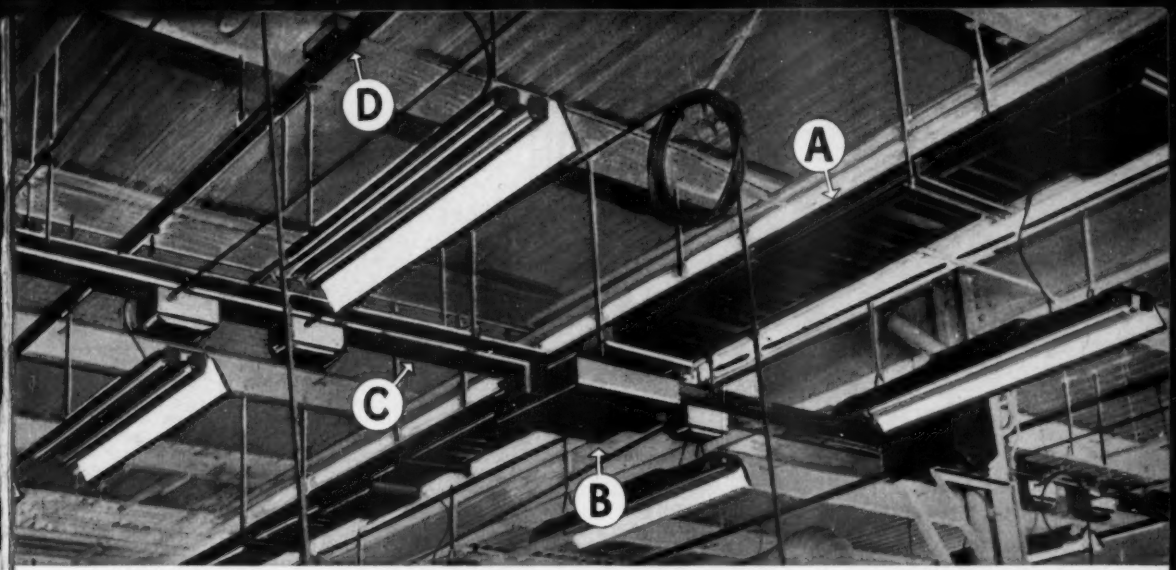
Hungry Horse Dam Project Calls for Big Ideas and Big Machines

These geysers result from unusual foundation treatment, in which water is pumped at high pressure into holes drilled in the bedrock foundation for the dam, to wash out a clay seam underlying a bedding plane in the rock



Photos: Bureau of Reclamation

Ferris-wheel like form is being lowered into spillway. A 2½ ft thick reinforced concrete lining will be placed in 35 ft diam, 1,125 ft long tunnel. When completed, water cascading over lip of spillway will drop a maximum of 490 ft



MAIN FEEDER AT SEALED POWER CORP. Trumbull LVD FLEX-A-POWER high-capacity feeder (A) distributes power through plant with minimum voltage loss. Can be dismantled, relocated with complete salvability. Tap box (B) takes off power for FVK secondary feeders (C). 600-4000 amperes. LTG (D)—see below—is used for lighting. Bulletin TEB-1.

SECTIONALIZED POWER FEED

is ready for quick conversion

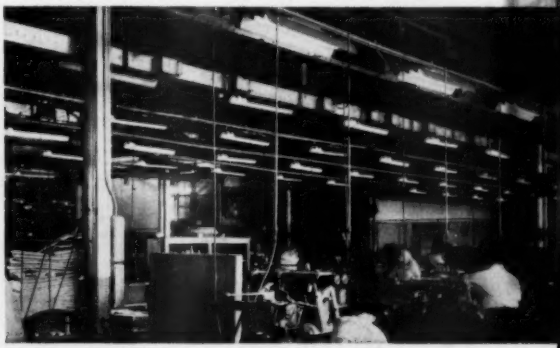
No plant... few buildings... can foretell what its power requirements will be months—or days—ahead.

But with FLEX-A-POWER® handling the electric power distribution from main switch or breaker to machine or lamp... any new requirement, additional load or rearrangement of load, can be easily met.

This system of standard-section busways gives utmost flexibility in power take-off, and, if necessary, can be taken apart for quick relocation. Easier to install than wiring and conduit—and more economical—it is ideal for a period when emergencies may develop, when conversion may be necessary.

Write us for literature on the types that interest you.

LIGHT-DUTY BUSWAY AT PESCO PRODUCTS Division of BORG-WARNER CORP. Use of LTG FLEX-A-POWER to distribute power to tools and lighting fixtures permits quick changes in machine layout without delay for rewiring. Busway can be tapped *at any point* by plug or trolley—every inch an outlet. Rated 50 amperes. Bulletin TEB-2.



SECONDARY FEEDER AT PESCO PRODUCTS Division of BORG-WARNER CORP. Nearly ¾-mile of 600 amperes, 440 volt Trumbull FVK FLEX-A-POWER takes power from a panelboard in parallel runs over entire area. 15 outlets to each 10-ft. section. No expensive rewiring needed when relocating loads. Can also be easily dismantled and re-installed. 225-1000 amperes. Bulletin TEB-4.

TRUMBULL (T) ELECTRIC

PLAINVILLE, CONN.

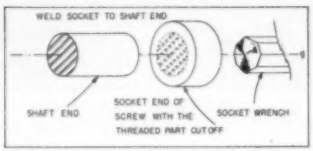
MAINTENANCE & OPERATION

of buildings, utilities and facilities

Improvised Crank

Contributed by Wm. J. O'Connell, Process Engr., Moraine Prod. Div., GMC

IN ONE location in the plant where a 1½ in. shaft had to be turned by hand against a light load, great difficulty would have been experienced



Socket wrench and screw-head serve as improvised crank for turning shaft

to remove the shaft to mill a crank end. Instead, the head was cut from a 1 in. Allen screw and welded to the end of the shaft. Then, by use of a matching Allen wrench, the shaft was turned without difficulty.

Industrial Truck Maintenance

PLANNED PREVENTIVE maintenance of industrial trucks assures reduced service budgets, longer truck life and less down time while trucks undergo repairs. Such a program should include these recommendations:

1. For scheduling your mechanical maintenance program, use a series of mechanical worksheets or tags prescribing services to be performed. Keep a fleet maintenance record to learn the life expectancy of important units of the truck.

2. Trucks need a monthly lubrication and mechanical check. A weak alkaline solution applied under steam pressure does a good cleaning job, and compressed air is best for drying. After the mechanical check, lubricate the truck. Make a large blow-up of the manufacturer's lubrication chart so your maintenance men can follow it easily. During the check, put the truck through its paces thoroughly in all speeds and with a normal load.

3. Let the right man—the mechanic—do repair work.

4. Semi-annual mechanical checks and lubrication are more extensive. This should include cleaning and repacking wheel bearings, changing drive axle grease or oil, and any other services not assigned to the short-term checkups.

5. Electrical checks should be conducted on a weekly, monthly and semi-annual basis. The weekly check includes tightening loose fittings and replacing worn or damaged ones. Monthly, all electrical operations should be observed closely, and semi-annually, the complete electrical inspection will save you money.

6. Be careful with your batteries. Overwatering will weaken the electrolyte, and when it spills over from the battery case, the electrolyte causes corrosion of other truck parts. Flushing the battery is a necessity, as the battery must be kept clean. Make this part of the weekly inspection.

7. Keep a weekly log for each truck, on which you record inspections, lubrications and cleanings. This permanent record will help you make sure necessary preventive maintenance functions are performed.

8. The program outlined is based on one shift a day and favorable operating conditions. Under rough conditions such as bad floors, more than average dirt, or more than one shift a day duty, trucks require more frequent use of some or all of these checks.

9. Loads should suit the truck. Teach operators that truck capacity varies with load length, and that continual overloading causes serious breakdowns and plays havoc with tire bills. It might be wise to use trucks with ample reserve capacity.

10. Replace tires when they develop flat spots or when big chunks

Photo: Automatic Transportation Co.

Maintenance man makes sure of proper lubrication, refers to enlarged copy of manufacturer's instruction chart

of rubber are gouged out. Stretching tire use damages the truck, costs you far more in repairs than you think you are saving.

11. Operators should be trained thoroughly in proper use of equipment assigned to them. Whenever possible each man should work permanently with the same truck.

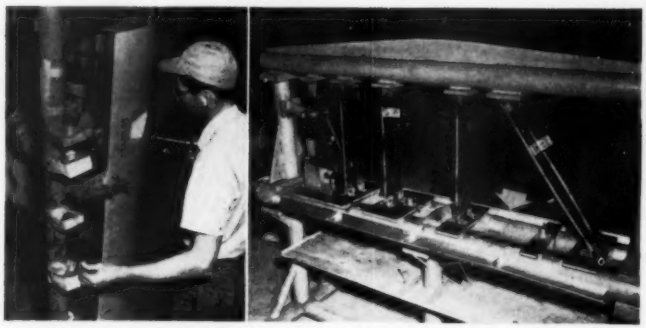
Insulation Helps Avoid Condensation Corrosion

CORROSION OF equipment due to condensation of moisture from hot gases can be avoided by insulating the heated equipment, according to The Magnesia Insulation Manufacturers Association. A typical use of insulation for this purpose is illustrated by a recent installation at the downtown steam plant of a Baltimore public utility.

To prevent air pollution by smoke from the boilers, giant dust collectors on the roof of the plant clean the smoke before it goes out through the stacks. The temperature of the metal collector shells must be kept between 280-300 F, since condensation and the resulting corrosion

Rivet Holders Make Working Materials Work for You.

Contributed by Chance Vought Aircraft



Improvised rivet holders used by riveters help to locate rivets close to work. An offshoot of this idea are the rivet holder trays on subassembly jig, right

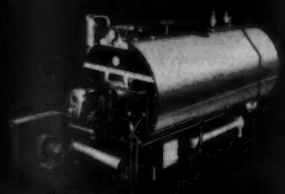
HERE'S PROOF!

Boiler rooms are
QUIETER, CLEANER, SAFER, with
SUPERIOR'S Built-in, INDUCED Draft.

Superior's Induced Draft prevents the escape of combustion gases into the boiler room . . . even through an open port. For our photo shows one of our engineers observing the fire through the wide open pressure-relief port.

It also explains one other distinct advantage of induced draft . . . the fact that the fire is pulled through each successive pass without impingement and wear on refractory as is the case under forced draft. For that relief port is at the end of the first pass where the combustion gases are turning the corner into the second pass. If they weren't being led, some of them would find their way out through the open port.

Greater quiet; longer trouble-free operation; cleaner, more healthful atmospheres are other primary results. We can't tell you the whole story here, but you'll find it all in our new catalog. Write today to reserve your copy of the newest edition. Ask for Catalog 305



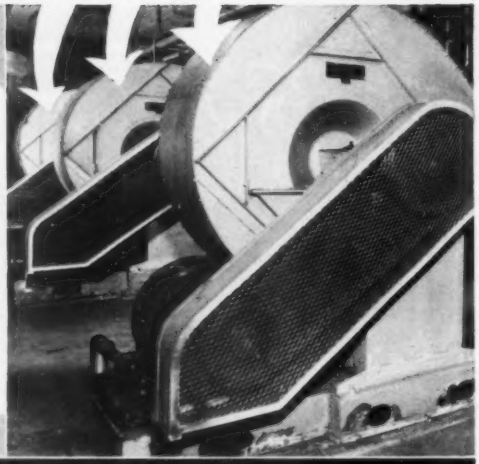
SUPERIOR COMBUSTION INDUSTRIES, INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N. Y.

SUPERIOR
STEAM GENERATORS

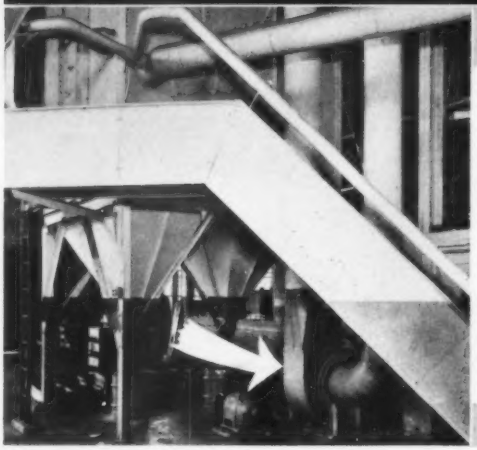
INDUSTRIAL PROCESS COOLING

Air delivered at high pressure by three Clarage Fans . . . a cooling job essential to production in a vital plant.

Every part of a Clarage Fan — bearings, bearing supports, wheel, housing — is built HEAVY-DUTY equal to the severest of air handling services.



HEAVY-DUTY . . . to Meet Your Defense Production Needs



EXHAUSTING DUST and FUMES

Clarage HEAVY-DUTY Fan in a Dustube cloth-tube collector system which handles lead oxide dust and fumes.

American Wheelabrator & Equipment Corp., Mishawaka, Indiana, manufacturer of Dustube Collectors has used Clarage Fan equipment extensively for many years.

DURABILITY PLUS! . . . fan equipment to master the toughest assignments . . . fans to meet any size, any type of air handling need! Clarage HEAVY-DUTY equipment is built above and beyond the demands of average service. It is the make of equipment so many engineers in industry prefer for their most important fan jobs. We welcome your inquiry for any desired data.

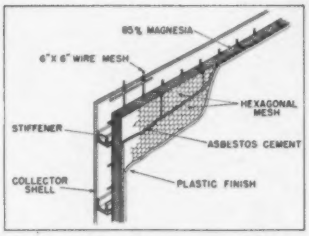
CLARAGE

—HEADQUARTERS for Air Handling and Conditioning Equipment

SEE OUR CATALOG IN SWEET'S

It pays to direct fan inquiries our way . . . phone our office in your city, or write Clarage Fan Company, Kalamazoo, Michigan.

Application Engineering Offices in All Principal Cities



Method used to insulate dust collectors to avoid possible condensation corrosion

would increase maintenance requirements and reduce the life of the collectors.

This degree of temperature control was obtained by insulating the collectors with a layer of 1½ in. thick 85 per cent Magnesia blocks. The insulation was applied over 6 by 6 in. wire mesh welded to the exposed angle stiffeners of the collectors. A layer of 1½ in. hexagonal wire mesh was then applied, and covered with a ½ in. thick layer of asbestos cement.

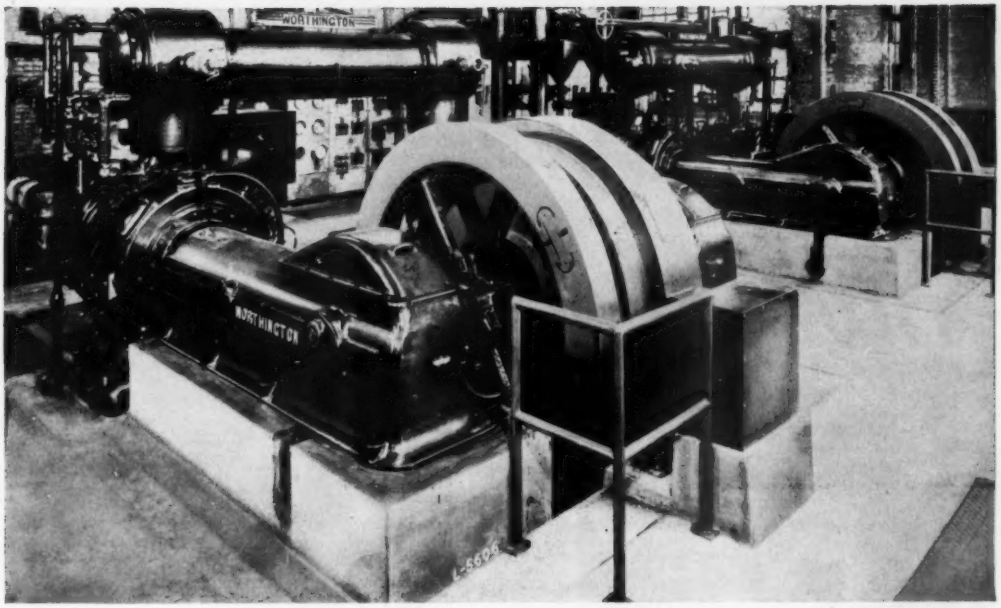
Since this particular installation is outdoors, the insulation was given a weather resistant finish. A layer of 1 in. hexagonal wire mesh was stretched over the asbestos cement, over which weather-resistant asphaltic asbestos plastic was troweled.

Pneumatic Tube System Speeds Blueprint Handling

DISTRIBUTING blueprints from a central blueprint station to outlying departments in the plant, is being accomplished by a West Coast manufacturer by the use of a 1-1/3 mile-long pneumatic tube system.

Designed and installed by the Lamson Corp., Syracuse, N. Y., the system comprises a 3 by 12 in. pneumatic tube network reaching from the central blueprint station to six substations. When someone wants a print, he calls the central station. The desired print is placed in a container and sent by tube to the nearest substation where it is picked up by, or delivered to, the caller. The

Use of a pneumatic tube system for handling blueprints eliminates the need of using multiple copies and saves time



Link-Belt "Hooks Up" with Worthington Air

You can't find a compressed air need that Worthington can't fill.

This installation pictured above is a Worthington DC2 air compressor in Link-Belt Company's Pershing Road plant in Chicago. And that picture could be duplicated all over America where engineering-wise plants insist upon dependable, trouble-free, low-cost air.

One reason is—*only* Worthington makes air compressors with the Feather* Valve. Any other valve is complicated beside this Worthington exclusive. Feather* Valve is the simplest, lightest, most efficient ever made.

Then there's Worthington automatic variable capacity control—acknowledged the most accurate, flexible and simple control obtainable. And Worthington's high-efficiency intercooler that needs less water, less power, less attention.

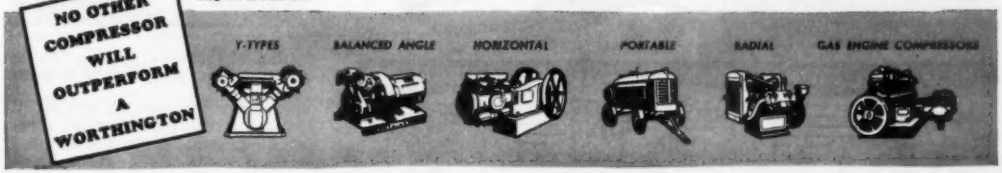
Build around these features with sturdy construction . . . back up the machinery with Worthington application engineering—and you have plenty of reasons for deciding *there's more worth in Worthington*. Worthington makes all auxiliary equipment, too. Write for bulletin L675 B-1B to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.

WORTHINGTON

*Reg. U. S. Pat. Off.

K.1.9

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

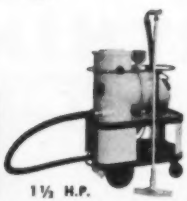


WHY GOOD *Plant Sanitation* COSTS LESS WITH SPENCER VACUUM

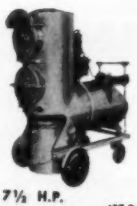
It is a fact that large or congested industrial areas can be Spencer Vacuum cleaned better and faster, at less cost, than by hand or with inadequate power. And with Spencer, the dirt container has ample capacity and is easily removed and rolled on casters to the point of disposal. In addition, special Spencer Vacuum tools take care of overhead pipes, walls, machinery and even the boiler tubes and hot materials which can be removed before they cool off.

AN EXTRA DIVIDEND. But the big saving comes when you apply Spencer Vacuum to the production line. For instance, you can recover valuable metal chips by the ton, convey loose materials by the carload, remove welding and other toxic fumes at their source and speed up bench and assembly work in every department.

There are at least 132 Essential and Unusual Uses for Spencer Vacuum in Industry—all described in Bulletin No. 144—yours for the asking.



1½ H.P.



7½ H.P.

427-B

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

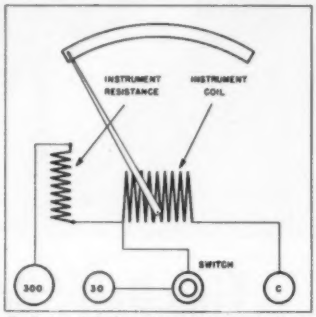
SPENCER HARTFORD

reverse procedure is followed when returning prints.

The system makes rapid deliveries at a speed of 20 to 25 ft per second and minimizes inter-departmental manual handling of prints. It also cuts blueprint production costs at least 40 per cent. Previously, as many as 15 copies of a given print would be required whereas now only two are needed—one "on call," and the other "on reserve."

Double Range Voltmeter Switch

THE DANGER of burning out the windings on a double range voltmeter by connecting the low voltage terminal to a higher voltage can be



Switch minimizes burned out windings

minimized by adding a push button switch of proper voltage rating. The low voltage reading can only be taken by purposely depressing the switch.

Cutting Oil Additive

A GREAT DEAL of difficulty was experienced by Yale & Towne Mfg. Co. from rancidity of certain cutting oils. The company experimented with a cutting oil additive to correct this problem.

William Shemeld, Superintendent of Maintenance at their Philadelphia plant, noted in preliminary findings

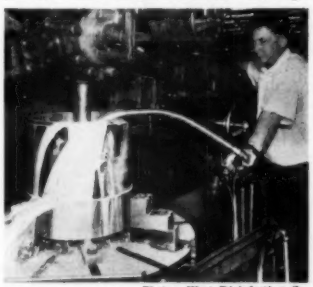


Photo: West Disinfecting Co.

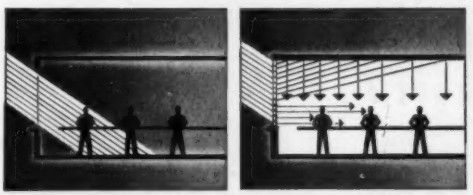
Cutting oil additive prolongs life of coolant from 2 or 3 days to 3 weeks

on a drill press, that the cutting oil additive at the recommended dilution allowed the coolant to be used for three weeks. Before its use, ran-

Window maintenance problems are virtually ended once Insulux is in—no painting, no rust or rot, no shades, no harmful glare—just plenty of free, natural, comfortable daylight.

Daylight is free . . . use more of it through Daylight Engineering

The problem of daylighting industrial areas can be solved by the selection of the proper Insulux Fenestration System. No longer is it necessary to paint out or shade glass areas in your plant to control glare. Light control through Daylight Engineering with Insulux light-directing glass block makes it possible to use the *entire* glass area for the transmission of light.



Direct sun causes uncomfortable brightness near windows, extreme contrast in other parts of room. Insulux Fenestration directs and spreads part of the daylight to the ceiling—diffuses the balance, keeps brightness at comfortable levels.

New Insulux Glass Blocks Numbers 363 and 365 reduce the necessity for careful orientation of glass areas because they control light so efficiently that they virtually "*turn your building with the sun.*"

Over and above daylight control other advantages in the use of Insulux Glass Block are:

(1) They are permanent; they do not rust or rot.
(2) They have a high insulation value.
(3) They are immediately available.

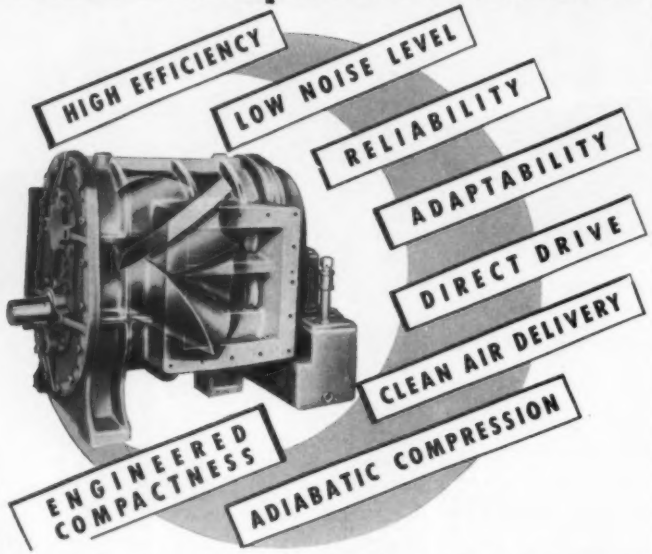
Daylight is free—Don't abuse it—Use It. Ask for the services of a Daylight Engineer to help you solve your daylighting problems. Just call, or write: Daylight Engineering Laboratory, Department P.E. 6, Box 1035, Toledo 1, Ohio. *Insulux Division, American Structural Products Company, subsidiary of Owens-Illinois Glass Company.*

INSULUX GLASS BLOCK

INSULUX FENESTRATION SYSTEMS

—by the pioneers of Daylight Engineering

The STANDARDAIRE BLOWER offers these exceptional features



WHETHER you require 20 cfm or 15,000 cfm capacity blowers these features are inherent in the unique design of the modern Standardaire positive displacement blower. Its epicycloidal rotor form acting as an air screw is unlike that used in the conventional lobe type unit—and Standardaire blowers have demonstrated their all-around superior performance to the satisfaction of many leading industrial users. Send today for complete information. If you have specific requirements our engineers will welcome the opportunity to work with you. Write Dept. E9 READ STANDARD CORPORATION, 370 Lexington Ave., New York 17, N. Y.

Do you have the 1951 STANDARDAIRE Selection Chart?

BLOWER-STOKER DIVISION

FORMERLY The Standard Stoker Co., Inc. ONLY THE NAME IS CHANGED

READ STANDARD CORPORATION

NEW YORK • CHICAGO • ERIE • YORK • LOS ANGELES

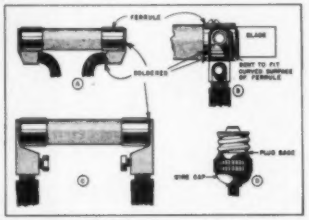
cidity developed in about 2 or 3 days.

As a consequence of these tests, the cutting oil additive is being used on every machine where an emulsion coolant was used. Since that time, no cases of rancidity have turned up in the plant.

Handy Ammeter Lead Connectors For Current Measurement

To SIMPLIFY the taking of current measurements with ammeters and watthour meters, simple terminal connectors can be constructed from blown one-time fuses.

As shown in (A), a 30 amp cartridge fuse case has a copper solder type terminal lug soldered to each end, and a test lead wire soldered into each lug. In use, the empty fuse replaces one of the circuit fuses and thus places the test leads in series with the circuit.



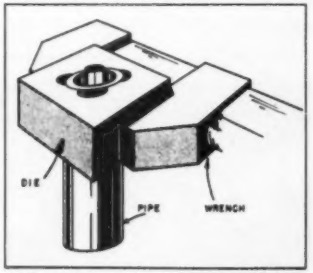
These connectors constructed from blown one-time fuses simplify the task of taking current measurement

For larger fuse cases, compression type terminal lugs are soldered to each end of the fuse case, shown in (B) and (C). This permits the leads to be detached for easier handling.

Item (D) shows a method of constructing a connector for use in plug fuse type circuits, using a wire cap and plug base.

Threading Pipe

SOMETIMES IT IS necessary to thread a pipe in a location where no type of threading stock can be used.



A die and wrench are tools needed to thread pipe in out-of-the-way location

In such a case, the job may be done by employing a square type solid die and turning it with a monkey wrench. The end of the pipe should be slightly beveled with a file to permit the die to start threading readily.

How to ZIP-UP a building!

Build it by *areas* instead of by *inches!* Use steel or aluminum Fenestra* "C" Panels! Just zip up your walls by interlocking these strong, simple sandwiches of metal and glass fibre insulation. You save time, labor, materials, money . . . your building is enclosed *fast* . . . and starts making money right away.

What's more, you can zip these walls apart and set 'em back up again farther out if you ever want to *expand* your building.

"C" Panels are light weight but tremendously strong and rigid. Only 3" thick . . . but with insulation value equal to that of a 12"-thick brick wall.† Incombustible. So smooth that dirt and grease can't get a grip.

They're another Standardized Fenestra Product engineered to cut the waste out of building (and maintenance).

And you can get *quick* delivery!

A Few Details on Fenestra "C" Panels

Size: Standardized 3" deep, 16" wide, 6' to 12' long, 18 gage painted steel or 16 B&W gage aluminum (or combination). Steel panels weigh only 6.50 lbs. per sq. ft. Aluminum 3 lbs.

Elements: Made from two formed members joined into a structural, vapor-sealed unit. Asphaltic impregnated felt is inserted inside full length between members and end closures to prevent metal-to-metal contact. Packed with glass fibre insulation. Double tongue and groove joints give three positive bearing surfaces per panel, making wall of vertical "C" Panels an integral unit.

For full information on specifications, performance data, installation details, delivery schedules, etc., call your Fenestra Representative today (he's listed in your phone book) or mail the coupon.

*Trademark

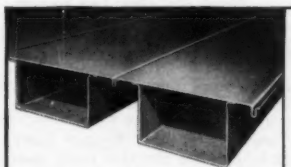
†This difference in thickness will give you 602 sq. ft. more floor space in a 150' x 250' plant!

"C" Panel Walls of The Kansas Power and Light Company, Hutchinson. Both steel and aluminum and "combination" panels were used. Architect: Black & Veatch, Kansas City.

Fenestra

PANELS • DOORS • WINDOWS

Engineered to cut the waste out of building



"D" Panels for smooth strong floors and long-span roofs. Standard width 16". Depth 1½" to 7½". Gages 18 to 12.

Acoustical "AD" Panels for combination ceiling, silencer, roof. Standard width 16". Depth 3" to 7½". Gages 16 to 13.

DETROIT STEEL PRODUCTS COMPANY
Building Panels Division
Dept. PE-6, 2280 E. Grand Boulevard
Detroit 11, Michigan

Please send me, without obligation, information on Fenestra Building Panels.

Name_____

Company_____

Address_____

Snap-on* Tools

...pay steady dividends

to the men... to the shop

Your tool dollars can't buy safer, tougher, faster tools than Snap-on Heavy-Duty *Professional* Tools! They'll take more punishment and deliver more service—as thousands of engineers and mechanics can certify. They're money-makers—keep a mechanic's productiveness up and cut plant down-time for double dividends. Direct service to industry everywhere through 41 factory branches. The Snap-on Industrial and General Catalogs belong in your files, where you can reach them quick! Write—

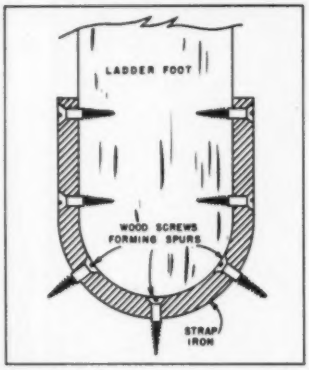
Using a Snap-on Heavy-Duty Ratchet and 1⅛" Socket to tighten brush holder adjustment on R. R. Diesel main generator.

*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION
8068-F 28th Avenue
Kenosha, Wis.

How to Prevent Ladder Slip

HERE IS a simple method for holding a ladder base rigid. This is accomplished by forming a piece of strap iron around the bottom ends of the ladder with holes countersunk



Some strap iron and several screws are all that is needed to secure ladder

for screws. The screws which project outward through the strap iron hold the ladder in place, while those that face inward hold the straps on the ladder feet.

Machine Counts and Packages Small Parts

AN ELECTRONIC packager, which can count and package up to 13,000 small automobile parts an hour, is being used at the main Buick parts warehouse.

The machine, equipped with 18 electronic tubes and two electric eyes, counts and packages anything from nuts, bolts, screws, washers and bushings to hundreds of other parts

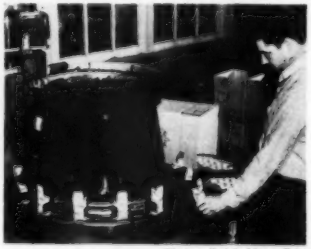


Photo: Buick Motor Div.

Machine counts and packages anything from small automobile parts to parts made of metal, fibre plastic or glass

made of metal, fibre, plastic or glass. It can be adjusted to count any number of parts from 1 to 1,000.

Vibrations of the hopper force parts to climb a circular ramp past an electric eye which counts them. Parts then drop into a chute which guides them into the carton. All the operator has to do is take out the full carton and put in an empty one.

• Internal
• Top Flange Mounted
Liquid Level Controller !

The new BS&B "Climax" Type 887 top flange mounted Liquid Level Control is the ideal, economical installation where a corrosive medium precludes the use of external piping. The type 887 is exactly the same as the amazing new 888 without lower cage housing. A hanger is provided to position the displacement element at the required level.

New Cone Point Pivot is practically friction-free. Torque tube and housing is *removable and reversible* without dismantling controller housing. You can employ *two* torque tube housings for two pilots and/or mercury switches!

Standard unit may be used for interface level control between two non-miscible liquids. Special floats available for specific gravity indication or control.

Available in three- and four-inch ASA flange sizes in iron, steel or special alloys. Larger size steel or special alloy flanges available for special applications. Write for new, fully illustrated catalog today!

BLACK, SIVALLS & BRYSON, Inc.
Adv. Dept., Rm. 55P, 7502 East 12th Street
Kansas City 3, Missouri

BS&B

"Climax" Type 887
INTERNAL TOP FLANGE MOUNTED LIQUID LEVEL CONTROLLER

NEW BOOKLET OFFERS TIPS ON TESTING... write for FREE copy

G. E.'s new "Buyer's Guide to Test Instruments" helps you select the right instruments for different electrical testing and maintenance jobs. For instance, the "Guide" tells you what instruments to use to:

- *prevent motor burnouts*
- *improve power factor*
- *troubleshoot*
- *locate grounded coils*
- *predict motor rotation*
- *balance loads*
- *record voltages*
- *check power losses*
- *improve efficiency, etc.*

AK-1 Hook-on volt-ammeter

AK-2 Hook-on wattmeter

AK-3 Hook-on Power-factor Meter

CF-1 Recorder

G-E portable testing instruments are sturdy, accurate, very easy to use. For example, the hook-on instruments permit voltage, current, or power measurements without interrupting service. Start now to make your testing jobs simpler. Fill out the coupon and send it in for your free copy of the "Buyer's Guide". General Electric Company, Schenectady 5, N. Y.

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Schenectady, N. Y.

Please send me a copy of your new "Buyer's Guide to Testing Instruments" (GEA-5469).

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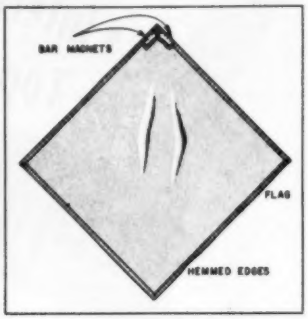
GENERAL ELECTRIC

Warning Flag



By sawing two small, powerful bar magnets in corner of red flag, it is a simple matter to attach flag to end of iron or steel pipe to serve as warning when threading long lengths of pipe

Reel Holder Attachment

Contributed by Edward Arndt, Allis-Chalmers Mfg. Co.

COPPER IN the company's coil winding departments is re-reeled to make up the necessary number of strands required for a particular job with the proper weight on each reel used. Previously, a trial and error procedure was employed which made it necessary to weigh a reel several times before the proper amount of copper was obtained on the reel.

Reel holder attachment on portable platform scale simplifies task of weighing copper strands required for job

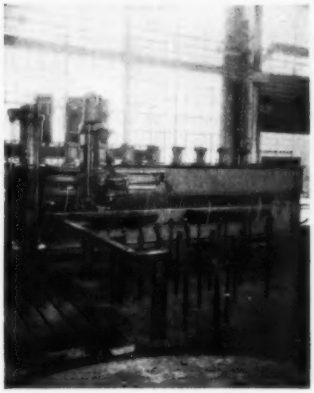
The idea of employing a portable platform scale with a reel holder was suggested. Now it is only necessary to set the weight required on the scale and re-reel until the scale balances. This new method has proven to be a time and work saver.

Caster Quiz

A "quick facts" feature with helpful suggestions on the use of casters... to reduce materials-handling costs, the "Reducible 30%"*

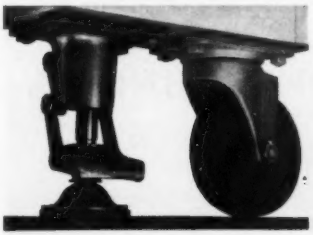
Q. How can large steel plates be supported for easy shearing and forming?

A. Grout or socket pipe standards into the floor at 18 in. intervals. On top of them, mount upside down, easy-swiveling Bassick Casters, at the desired height. By this device Westinghouse enables operators to move plates freely in any direction.



Q. Can trucks and portable equipment be easily held stationary?

A. Yes, with Bassick Position Locks, mounted as shown for quick accessibility. Easily applied and released by foot. Flexible mounting of 12 sq. in. braking surface assures good floor contact and firm grip both on even and uneven floors.

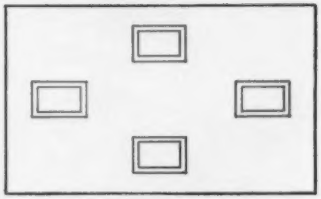


Q. What factors should be considered in picking the right-sized caster?

A. Load capacity and floor conditions. Consider maximum load to be carried, possibility of overloading. Allow a bit more than the load you estimate. Consider rough floors, sharp door sills, obstructions, elevators, etc. *Select a wheel large enough to ride over obstacles easily.* The larger the wheel, the easier the equipment will roll.

Q. Guess how many ball bearings were used in making Bassick Casters in 1950?

A. Over 400,000,000 . . . a record high for the world's largest manufacturer of casters and wheels, in the world's widest range of sizes and types.



Q. When should only rigid casters be used on trucks?

A. It's economical to use rigid casters alone, on balanced center, for light loads, travelling long, straight distances.

$25 for your materials-handling solution!

If accepted for use in this advertising, we'll pay $25.00 for any case history of how you've used Bassick Casters to deal successfully with a particular difficulty. Address the world's largest manufacturer of casters and floor protection equipment . . . THE BASSICK COMPANY, Bridgeport 2, Conn. Division of Stewart-Warner Corp. *In Canada:* Bassick Division, Stewart-Warner-Alemite Corp., Ltd., Belleville, Ont.

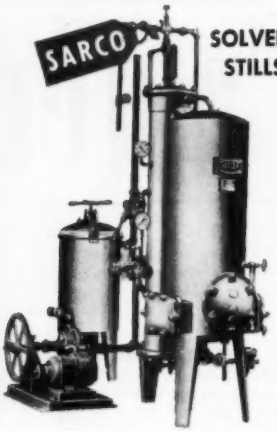
* *According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.*

SEE OUR CATALOG IN SWEET'S

Bassick

MAKING MORE KINDS OF CASTERS ... MAKING CASTERS DO MORE

METAL WASHER



SOLVENT STILLS

A MARK OF DISTINCTION

When you buy steam equipment

Equipment on which
SARCO
is standard

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BOTTLE WASHERS
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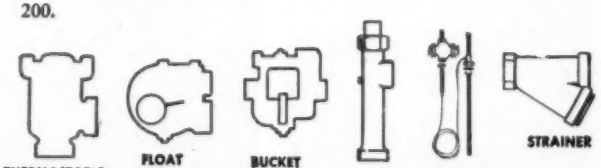
CAP SEALERS
•
DEGREASERS
•
AIR CONDITIONERS
•
SOLVENT STILLS
•
AIR COMPRESSORS
•
OVENS & BOILERS
•
LAUNDRY MACHINERY

Why is it that more than 100 manufacturers of steam operated machinery prefer to equip with Sarco steam traps, temperature controls or strainers before the equipment is shipped? The answer is simple. After years of tests in their plants and in the field they know that their machines will produce more with less steam and fewer service calls.

Isn't that exactly what you want from *all* the steam equipment installed in your plant? If so, all you have to do is to insist on "Sarco Equipped" when you buy new machinery or modernize your present equipment.

A few of the Sarco products supplied with new equipment are illustrated below. For complete information write for Catalog No. 200.



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Whatever your factory heating, ventilating, cooling or air conditioning problem is, look for the answer in the Trane line.

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Craneway—High ceilings and craneways are no obstacle to efficient heating. Not with Trane Projection Heaters and Louver Cone Diffusers to deliver heat to working areas.

Machine Shop—Trane Roof Ventilators handle the extra heat generated by machines in shops like this one, drawing in outside air, heating it, circulating it.

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With the new AK-3 hook-on power-factor meter you can read power factor quickly and accurately. Then with a table like the one above, you can readily determine how much capacity you can release and how many capacitors you will need. Also, the hook-on power-factor meter helps to pin-point those feeders with low power factor—tells you where to install capacitors for maximum benefits. List price of the AK-3 is only $84.75.

For more information contact your nearest General Electric representative, agent or distributor. Or, send the coupon today.

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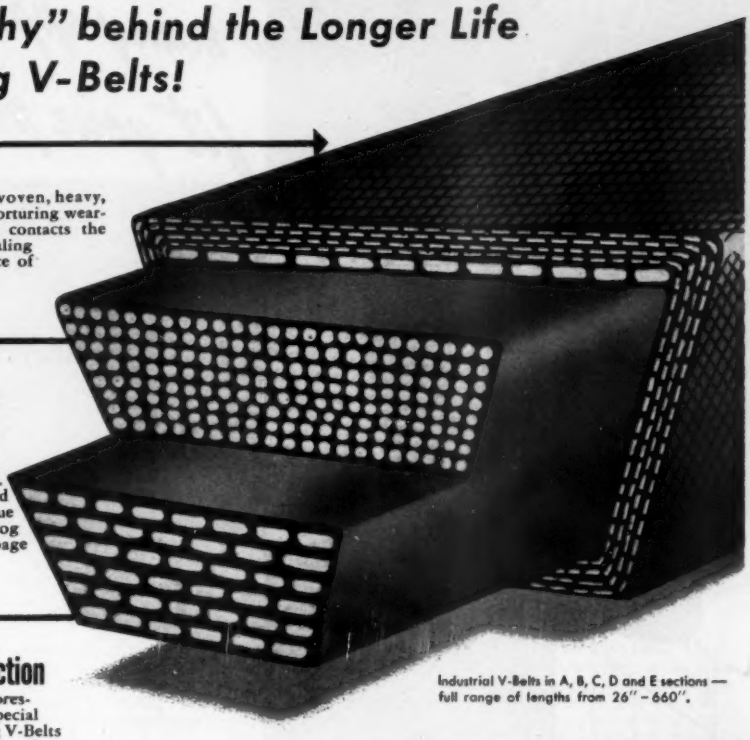
3 **Compression Section** — a BWH-developed compression section of fabric and special compounds permits Bull Dog V-Belts to run cooler and prevents their cracking or deteriorating under severe flexing.



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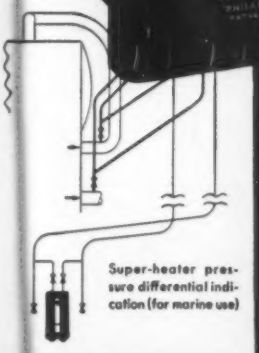
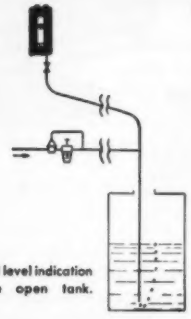
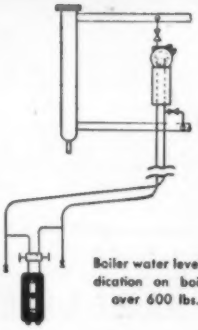


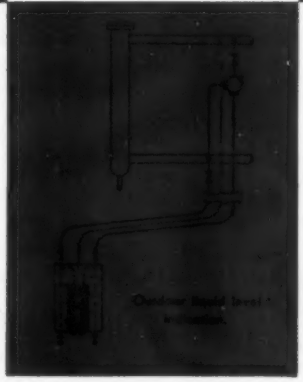
Super-heater pressure differential indication (for marine use)

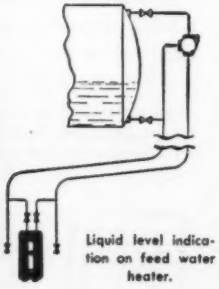


Liquid level indication above open tank.



Boiler water level indication on boilers over 600 lbs.





Liquid level indication on feed water heater.

YARWAY REMOTE LIQUID LEVEL INDICATOR

Dick Morris starting on the first leg of his flight to England for the plant engineers convention

From All Over the World The Plant Engineers Gathered for 4th Annual Convention

The Institution of Incorporated Plant Engineers with over 15 branches and 2000 members scattered around the world holds its Fourth Annual Conference May 22-24 at Buxton in the Heart of England . . . The Festival of Britain, The British Industries Fair and a score of special events during the summer season swells the overseas attendance

FOR THE FOURTH time delegates and members of the Incorporated Plant Engineers gathered for the annual conference of the society. Previous conferences were held in the industrial centers. This year the conference was held at Buxton in the heart of England's resort country, the Derbyshire Hills, with wooded dales and trout streams made famous by Isaac Walton.

The growth of this society has been phenomenal. Probably nothing else better illustrates the need for, and universal appreciation of, the plant engineer in every country where modern industry is involved. Started late in 1946 as an outgrowth of a group of plant engineers interested in the maximum use of the limited supply of spare parts and the pooling of experiences, the society now has some 2000 members in 26 countries. In spite of the high membership requirements of the association, 115 candidates were elected in the first quarter of 1951.

The Editor of Plant Engineering, the first American member of the society, flew to England for the convention to present a paper, visit representative plants to compare American and British practice and to confer with officials of the Anglo-American Council on Productivity. Exchange of technical information is part of the program of the Economic Cooperation Administration. Heretofore this activity, industrially, has been largely confined to direct production but beginning early this fall plant engineers will also be included.

A first hand report of the conference will appear in the next issue. The following pages give abstracts of a few of the highlights available prior to the conference. These include brief abstracts of three papers, brief because they are readily available in complete form in the Journal of Incorporated Plant Engineers. In addition preprints of "The Plant Engineer in the USA" are available without charge upon request to the Editorial Department of Plant Engineering as mentioned in the boxed item on a later page.

The other two papers, presented in abstracts, are the prize winners in the society's Alexander Duckham Memorial Award. These two awards, a Silver and a Bronze Medal, are presented annually by Alexander Duckham & Co., the lubricating oil firm, as a memorial to the founder of the company. A third award, the Junior Member's Annual Award, presented by the society from a fund started by L. G. Northcroft, past president of the Society and managing director of the Spirex Manufacturing Co., will not be available until later.

Conference headquarters at the Palace Hotel in Buxton. This in the center of the resort country with seven other hotels in the immediate vicinity to insure adequate living accommodations

J. LACHLAN STURROCK is a chartered surveyor and honorary secretary of the Birmingham Branch of the Incorporated Plant Engineers. He was elected a member of the society at the first meeting while a member of the then Road Board Committee on Design of Plant for Road Construction. After finishing his war service as Officer-in-Charge, Development Section, Earthmoving Plant in the Army and Ministry of Supply he joined E. Boydell & Co., of Birmingham and is now District Manager for the company His paper was awarded the Silver Medal, or first prize, in the Alexander Duckham Memorial Competition.*

Selection of Earthmoving Equipment

Major factors in selection and use of earthmoving equipment . . . Soils and the site . . . Obstructions . . . Desired finish . . . Availability, capacity, control and operation of equipment . . . Importance of maintenance and outage time . . . Theoretical capacity vs practical factors

By J. LACHLAN STURROCK

EARTHMOVING, as a distinct phase of construction, has risen to prominence so rapidly in this country that all the factors and problems involved in its economic application are not always clearly understood by those responsible for the selection and use of equipment. To impede efforts further, there is a serious lack of published information presented in a manner suitable for rapid reference by engineers who have many other problems to deal with.

The Material

When selecting equipment for earthmoving problems, the factors to be considered can be grouped under four major headings. They are: 1, Type, or types, of material to be worked and its condition; 2, physical characteristics and layout of the site and the final objective; 3, the equipment readily available; and 4, climatic conditions.

Distribution of particle sizes in a given material, as well as a straightforward variation of average sizes between two soils, will affect output because of varying resistance to cutting by blades or teeth and also in the "heaping" and "swell" qualities of the material.

Heaping is that characteristic of a granular material which enables it to stand in a pile when deposited. This has a considerable effect on capacity of all types of equipment. Swell is that characteristic of materials in a natural state in which their volume increases when they are dug and loosened. Conversely their volume decreases when they are compacted.

The three conditions of the material are usually referred to as: bank measure, in the natural state; loose measure, when dug; and compacted measure, when consolidated. Compacted measure is almost always less than bank measure, a factor which must be considered when cut and fill calculations are being made.

Variation in moisture content and in the liquid and plastic limits has a considerable effect, both on the digging by any type of equipment and on the heaping factor. This particularly applies to digging in cohesive or clayey materials and to heaping in non-cohesive or sandy materials.

The distribution of moisture in a material is also of importance, as for instance, the effect on a wheeled vehicle of a clay with low moisture content but with a wet surface.

Aside from the nature of the material, the remaining factors that arise from a consideration of the site and the work required to be done then resolve into the following: Time; quantities and depths of material; distances and gradients; surplus materials, deficient materials, natural obstructions; manufactured obstructions, above, on and below the ground; and the degree of finish required.

Time Requirements

When the most important factor on the job is the time available, many of the other factors take a secondary place and means be resorted to which would normally be regarded as uneconomic. Such an approach to a job often simplifies the equipment selection problem. One danger to guard against is too much equipment. This, if overdone, can cause site congestion and seriously slow down operations.

Generally, it is always safe to say that, having selected a certain type, or combination of types of equipment for a job, it is best to use largest machine practical. Unless special problems of obstruction or piecemeal working decree otherwise, "fewer and larger" is the rule to follow for cheapest results.

The possibility of surplus materials from the work must always be carefully considered. Unless suitable dumping grounds are planned for serious dislocations of the operation will follow. The necessity for storing and reusing topsoil is also a factor which may influence equipment choice. It is equally important to consider the supply of material for fill from outside the site, when necessary. The arrival of this must key in with the spreading program for site fill and additional equipment may be necessary to deal with it.

Natural obstructions may, if geological, call for special plans to deal with them. If they are topographical, they may require the provision of additional means to overcome them, but are more likely to affect the haul distance factor.

Under natural obstructions can also be listed the surface condition of the haul lines. This factor will depend to a large extent on the size of the site and the nature of the surface. By reason of the effect on haul speeds and wear and tear, it is often more economical to make and to maintain dirt haul roads, utilizing site materials, or in cases of exceptionally heavy traffic, to actually build conventional roads.

Roads Help

Manufactured obstructions are normally underground services of all types: roads, fences; buildings on the surface; or overhead services. This is a factor requiring careful consideration. On a site which could normally be worked on a large scale they can have the effect of

*The paper will be printed in full in the Journal of the society. Copies can be obtained from Hadleigh S. Seaborne, General Secretary, Incorporated Plant Engineers, 48 Drury Lane, Solihull, Birmingham, England, for 5 shillings (Approximately 70c) per copy.

dividing the site into several smaller ones. Thus the same equipment can not develop its full effectiveness and it's better to use smaller units.

The degree of finish required on completion of the earthmoving can affect the choice. The general purpose earthmoving machines can be worked to surprisingly fine limits and will often suffice to leave the site in the form desired.

Compaction of fills can be regarded as a finishing process of earthmoving. Special equipment is often necessary to achieve the desired results. It should be noted in this connection that the degree of compaction afforded by the hauling and spreading in some types of material is often much greater than is generally allowed. Savings in cost can be made by studying this point.

From a study of site conditions, the work should be planned to suit the topography. This is a basic factor which can on occasion influence the choice of equipment. The work should be planned wherever feasible to obtain all the assistance possible from gravity for all classes of machines produce more when they are moving the material downhill.

Theoretical machine outputs are readily available from manufacturers or from published data. In utilizing these figures to assess capacity and quantity of machines required for a job, it is also necessary to consider other variables which can affect these theoretical outputs.

Practical Considerations

The plant operator (or driver) has become a skilled craftsman and the lack of this skill can cause considerable reduction in output.

Control of the plant is the measure of the ability of the person immediately in charge of the work to organize, balance and maintain equipment on the site in such a manner that all the equipment is working at maximum efficiency with a minimum of lost time.

Mechanical reliability and maintenance can influence both the theoretical outputs of the machines and the general economics of the job. Continual breakdowns and repair stoppages will destroy all output estimates. Machines in a low state of efficiency will cost as much, or more, to run as efficient machines, yet only produce a percentage of the output, with correspondingly increased costs per unit.

There have been advocates of the complete closing down of work in bad weather and working double shifts in the better weather seasons to compensate for this. It will generally be found that much can be done to maintain reasonable outputs at all times by the judicious provision, before they become necessary, of adequate surface drainage and, where necessary, hard roads and standings.

CURRENT PRACTICE IN THE USE OF EQUIPMENT FOR DIFFERENT EARTHMOVING OPERATIONS LISTED IN THE ORDER OF PREFERENCE

OPERATION	EQUIPMENT USED	REMARKS
1. CLEARING AND GRUBBING.		
Light Clearing. Removing scattered clumps of bushes and small boulders, etc.	Bulldozer (cable type). Angledozer (cable type). Bulldozer or angledozer (hydraulic). Scraper (tractor drawn).	
Medium and Heavy Clearing. Removing heavy thickets, trees and large boulders, walls, fences, ditches, etc.	Bulldozer (cable type) with heavy towing winch. Angledozer (cable type) with heavy towing winch. Bulldozer or angledozer (hydraulic type) with heavy towing winch. Tractor mounted logging winches, tree-dozers and stump-grubbers.	Only for specialized forest clearing. Explosives may be required for large trees and boulders.
Light Stripping. Removing leaves, twigs, grass, turf, heath and organic soil.	Dozers (any type). Scrapers: (a) with rubber tires. (b) with crawler tractors. Skimmer shovel. Loading shovel. Graders.	For long hauls. For short rough hauls. Requires transporting equip. Requires transporting equip. For narrow sites only.
2. DITCHING AND WATERWAYS. **Small drainage ditches.**	Tractor drawn ditching ploughs. Dragline excavator with side boom. Graders.	No flexibility in size of ditches. Rapid but not suitable for marshy ground.
Larger Ditches and Work on Existing Waterways.	Dragline excavators. Graders (all types). Scrapers. Dozers.	For underwater work. For opening new ditching and waterways; for largest sized works elevating grader most suitable.
Trenching. Excavating deep narrow trenches with vertical sides.	Continuous bucket trenchers. Drag shovels. (Back acters.)	
Backfilling. Replacing excavated material in a trench or against a structure.	Dozers. Graders. Loading shovels. Dragline or shovel.	For sidecasting into ditches.
3. EXCAVATION AND EMBANKMENT. Digging, loading, hauling, dumping and spreading of any soil material.	Scraper and rubber tired tractor. Scraper and crawler tractor. Dozers (all types). Walking dragline excavators. Dragline or Shovel excavators. Skimmer excavators. Elevating graders or belt loaders. Drag scrapers and slackline excavators. Rooters and scarifiers.	Best for long hauls. May require tractor pusher. Best for intermediate hauls and in heavy wet ground. Best for short hauls. Type according to nature of work. For large scale stripping in deep cuts. May require hauling equipment, but best for confined face work and deep cuts. For work on restricted sites. For large scale work in suitable material. For very hard formations.
4. SPREADING Distribution of fill in uniform layers.	Scrapers (all types). Dozers or graders working in conjunction with dumpers or trucks. Dozers, graders or drag scrapers.	For material moved short distances only.
5. SCARIFYING AND SHAPING. Loosening layers of subgrades and forming the surface to exact grades.	Graders with scarifiers. Rooters. Ploughs. Dozers.	
6. LOADING. Placing already excavated material or loose material in hauling units.	Skimmer shovels or grabs. Loading shovels. Endless belt or bucket.	
7. HAULING. On Site.	Dumpers. Scrapers. Towed dump wagons. Rail trucks. Conveyors.	For soft sites mainly. Where quantities justify cost.
Off Site.	Tipping lorries.	
8. COMPACTION. Consolidating and binding thin layers of dumped material.	The haulage plant (Compaction a by-product of its use). Rubber tired rollers. Tamping rollers. Smooth rollers. Vibrators.	May not consolidate sufficiently for some requirements. Crawler tractors and scraper give best results. Material requires to be spread in thin layers. Not suitable in sticky materials. For thin layers only. Give highest degree of compaction but slow in use.

GEORGE E. HALTER was born in 1900 and has been with the National Oil Refineries at Llandarcy, England, since 1921. Starting in on maintenance work he earned successive promotions and for the last seven years has been plant engineer in charge of the entire refinery. This year he is chairman of the South Wales Center of the Incorporated Plant Engineers, a branch of the association with about fifty members. His paper "The Plant Engineer—A Study in Responsibility" was awarded the Bronze Medal, or second prize, in the Alexander Duckham Memorial competition, an annual event at the institution convention.*

The Plant Engineer in Great Britain

A review of the desirable training, experience, and character of a plant engineer with his responsibilities and problems from the English point of view . . . A comparison indicates that the English plant engineer has much in common with his American industrial contemporary

By GEORGE E. HALTER

MODERN CONCEPTS of a plant engineer vary considerably and very few people, many of them plant engineers, appreciate the qualities, character and background necessary to qualify a competent man in this profession. A successful engineer, a specialist in a particular branch, in no way qualifies and this paper has been submitted to clarify this compound term "Plant Engineer."

Most essential of the requirements needed are: a techanical education; honesty of purpose and an earned reputation for giving a fair deal to all classes of labor; and, an understanding of the plant and all equipment including the actual operations which the plant or equipment performs.

"George on the Horn"

Perhaps the most unusual part of the plant engineer's makeup is his devotion to his job. He must be at the beck and call of the plant at all times. In production plants he must also be prepared to spend evenings and nights giving personal attention to a breakdown or to a plant test run. To this end many a plant engineer lives at the end of a telephone wire.

Experience and training which he should posses are varied and cover a wide field. It is usual for the plant engineer to be in direct control of all labor on maintenance work. As this may entail supervising fitters, turners, machinists, blacksmiths, welders, boilermakers, erectors, general labor, bricklayers, laggers, painters, electricians and many others, it is obvious that the experience necessary to carry out these duties is unique.

It seldom happens that a man has had the opportunity of obtaining the necessary experience to control and direct such a variety of trades, and it is this very factor which places the efficient plant engineer in a class of his own.

Although there are exceptions to all rules, it is generally found that the plant engineer has studied engineering in some form. By following this with some years in various branches of the engineering field, the modern plant engineer is on his way. The stepping stone to the position of plant engineer in any fair-sized undertaking is usually as a foreman. This experience in foremanship is invaluable when the time comes to be promoted plant engineer. This is the time when experience in human relationships is gained, for personal contact with union representatives is part of the everyday routine.

Under modern methods of management it is usual for the foreman to become acquainted for the first time with costing and cost control. Estimates have to be submitted, and before these can be prepared the foreman must possess knowledge of prices of materials, rates of pay and personal knowledge of the time factor required to accomplish a job. It is, however, when the appointment to plant engineer is gained that the realization of the full scope of unexplored knowledge necessary to hold down the position is evident.

Study in Responsibility

The question of records and systems deserves a paper to itself. The efficient plant engineer usually devises his own systems and normally considers his ideas to be better than others he has heard about. The particular method employed does not matter so long as it can be worked by the plant engineer himself and by deputies in his absence. Intricate systems which can only be operated by the inventor should not be encouraged.

Perhaps the most essential details concern the operating staff. One of the most useful systems to adopt is a weekly staff return sheet. This consists of a single sheet on which every individual in the department is listed. The sheet gives the total at the prevailing week-end and also the total at the previous week-end, detailing any increase or decrease. On the back of the sheet can be recorded all movement of personnel.

Figure 2 illustrates portions of an actual staff return sheet and at the right a portion of a wall chart which carries over two years and is renewed yearly. Before posting the new chart the details for the previous year are recorded. By this means a picture of staff returns for at least one year is always in sight.

Maintenance Charts

The plotting of absenteeism is important and the effect of holiday periods is obvious. The plant engineer must evolve ways and means to spread the loss of man hours over as long a period as possible. This question has a tie-up with planned maintenance. If, for instance, August is the peak for absenteeism, illness and annual leave, then no major plant overhauls should be planned.

Recording maintenance work on important plant items is very necessary and the writer uses a method which was devised to allow one system to operate throughout the department. Figure 1 shows a centrifugal pump maintenance chart as evidence of the simplicity and usefulness of the system. The system can be used to show practically any type of maintenance work. To pro-

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*The paper will be printed in full in the Journal of the society. Copies can be obtained from Hadleigh S. Seaborne, General Secretary, Incorporated Plant Engineers, 48 Drury Lane, Solihull, Birmingham, England, for 5 shillings (approximately 75 ct) per copy.

vide the necessary information in record charts it is necessary for each department to submit a monthly report. This is submitted by each section foreman and is the basis of the complete monthly report prepared by the plant engineer. This report being to hand, very little time is required to enter the required information on the charts.

Every plant engineer should provide himself with a complete Plant Item List. This may involve a few dozen items in the case of a small plant but may run to thousands in large industrial plants. In the first case a ledger type system is all that is needed but the latter requires a modern card system of some kind. The more information that is recorded against each item the more useful the records will prove.

In the course of time many drawings and catalogs are sent to the plant engineer, and as these may be required at any time a system must be evolved whereby they may be stored in the smallest space and yet be picked out in a few seconds.

Spares

Plant spares are of great importance to the plant engineer. It should be the duty of the plant engineer to prepare charts showing the items required, the suppliers, the minimum stock and the number which must be ordered when the minimum stock is reached. On arriving at these numbers the delivery period necessary for obtaining fresh stock is of utmost importance.

It is usual to find that a state of war exists between the plant engineer and his management because of the necessity of maintaining idle capital (stock), but the plant engineer must have spare parts if he is to be held responsible for maintaining continuous output.

PM and Safety

A great deal has been written and spoken in recent times of the advantages of planned maintenance. In well-organized works an attempt has been made to draw up time tables, which, while allowing for certain production quotas, give the plant engineer definite periods in which to overhaul equipment. In many cases, by careful study and cooperation between heads of departments and the plant engineer, little over-all reduction of output is incurred, while the value and condition of the plant is maintained at a very much higher standard.

The safety regulations governing his particular class of industry demand a high sense of responsibility The plant engineer must see that all statutory regulations called for by the recent Building Trades Acts are carried out. The majority of engineering and chemical works use compressed air for a variety of operations, and its careless maintenance is fraught with many dangerous hazards. Faulty lubrication can cause explosions; dirty, choked water jackets of compressors can lead to accidents. The maintenance of air receivers with annual insurance inspection is of importance, including the plain marking of safe working pressure.

The plant engineer in industry today finds himself compelled more and more to study elementary metallurgy and to familiarize himself with many new materials which have gained a place in the engineering field. The engineer of a few years ago would order a piece of bar steel for a pump shaft or pinion shaft of a gear box. Today he has to be far more detailed and usually gives a definite specification.

Among the great allies are the various hard surfacing materials and the special processes. Up to 300 per cent greater life in wearing parts can be obtained by using the most suitable of these. In large plant maintenance a metal spray gun becomes a tool of the utmost importance. As zinc, aluminum, monel, stainless steel and brass can all be sprayed it is apparent that a broad field is opened up.

Research

Although the plant engineer rarely has the opportunity to take part in research work of a highly technical nature there are many ways in which he can conduct his own private researches. Perhaps the most successful way is to compile a list of all black spots in his works. The list may contain a variety of items such as a bearing which constantly gives trouble, a particular machine which too often breaks down, a piece of tiled flooring which is constantly being ruined by chemical action, corrosion or erosion taking place in a particular piece of equipment.

The list is carefully studied, the causes of failure assessed, and, from his own knowledge or on advice from manufacturers, a new material is substituted and a test sheet prepared. As the test progresses it is duly reported on each month. In

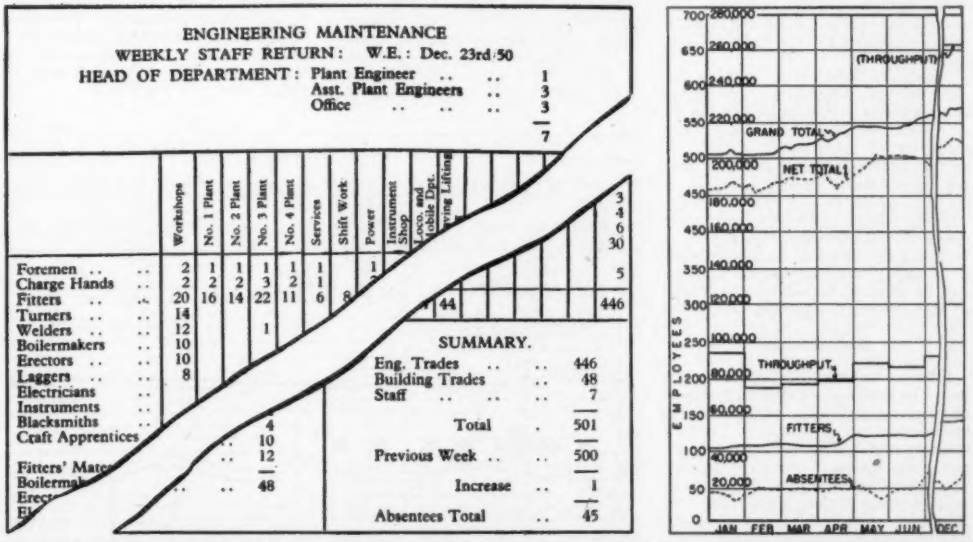


Fig. 1. Accurate knowledge of the operating force is vital. The weekly report at the left shows a breakdown by job and numbers. The chart at the right covers a 2 yr period and shows weekly fluctuations and a comparison with plant output

all probability the black spot on this piece of equipment will shift to some other part and the process of testing will start over again.

As many as 20 to 30 tests may be running in a large plant. These justify an inspection report and a detailed report, say every three months. After a year or so the plant engineer should be able to look back on his private research work with satisfaction.

Labor Relations

Among the foremost of the plant engineer's responsibilities is the question of labor and all it involves. It is sure to provide him with some of his greatest difficulties. It is usual for high management to entrust the major part of labor control to the plant engineer. The frequency with which labor troubles arise is often taken by the management as a measure of the plant engineer's efficiency.

The roots of nearly all labor difficulties lie in the pay packet and the problem which confronts the plant engineer is the settling of the grievance in such a way that other grievances are not immediately aroused.

The introduction of incentive schemes usually brings headaches for the plant engineer. It is frequently found that the operational staff are paid piecework rates. Because of the varied nature of the maintenance work it is assumed they must work to day rates. This causes the "grouse" that the maintenance man is driven hard and continuously merely to enable the production side to earn high wages. Another important feature of the dual system is the careless and sometimes ruthless handling of plant and equipment for the sake of output.

The shop steward in modern industrial concerns is an influential individual and should be treated by the plant engineer as an ally. The majority of labor disputes can be settled between these two. Discussing future plans, appointments, conditions, piece rates, etc., with the various shop stewards generally tends to create good feeling in a works, although it is important that the union representatives should not be allowed to usurp the duties of functional management.

Lubrication

Efficient lubrication has of recent years become an art and many plant engineers are finding out how little was known about this vital "tool of maintenance." The wise plant engineer now makes a complete survey of all equipment under his control with a view to insuring that the lubricants used are equivalent to the makers' recommendations.

It is realized that it is not very convenient to stock a large number of grades and makes of oil and grease. The fewer these number, the less risk there is of an unsuitable lubricant being used. Many schemes are in operation, such as colored containers and packages, numbered lubricants, indicator discs fitted at all filling points; special attendants for lubrication duties, etc.; all designed to ensure a higher degree of efficient lubrication.

In welding we possess perhaps the greatest aid the plant engineer has, one which permits him to use initiative and improvization to the utmost. High class welders are rarely looking for employment. The plant engineer is usually faced with the training of his own team to suit the particular needs of his industry. The wise plant engineer adopts a set standard and attempts to bring his welding staff up to this efficiency. Welders who fail, after reasonable training, to approach this standard should be dispensed with, as faulty welding on maintenance work can prove very expensive, besides being a hazard.

Welding and Workshops

Workshops of an industrial concern are of utmost importance. The plant engineer should give a good deal of attention to the equipment, facilities, cleanliness, ventilation, lighting, machine tools, handling gear, safety precautions and the many other things which go to make up efficient workshop production.

The plant engineer has usually a hard fight to justify to his management the necessity of new machines, tools and modern methods, and far too often is expected to produce work of a high standard on unsuitable machines. This raises a fairly general problem: that of responsibility for work leaving the shops.

In smaller workshops the foreman is expected to accept this responsibility but in the larger shops the plant engineer is well advised to consider a system whereby work is passed by an inspector before leaving the shop. The cost of this inspection, although not generally appreciated, is always saved by the employer. Faulty work reaching the job can cause an enormous expenditure of man hours to correct by hand, or return to the shop. In addition further breakdowns are encouraged with consequent cost to the plant.

Knowledge Peddlers

Until recently the only instruments with which the plant engineer need concern himself were a few simple ones. He now finds himself installing flow recorders, flow controllers, temperature recorders, temperature controllers, CO_2 recorders, electronic devices, photocell controllers, air controlled mechanisms, level control equipment and a host of other devices. He has to study the correct positions for installation, make necessary calculations, obtain the correct type of instrument, and familiarize himself with the maintenance of his instruments.

The successful plant engineer today is a very busy man and it is true that only a busy man can make time to do a little more. All plant engineers are advised to spare a few minutes for representatives of accredited firms. The information and experience which form part of their everyday "schooling" can be obtained in return for the courtesy of receiving these "peddlers of knowledge."

It cannot be stressed too strongly that the plant engineer of today is unique in the field of responsibility, and has created for himself a respect and a position which compels management to recognize his importance in the industrial organization.

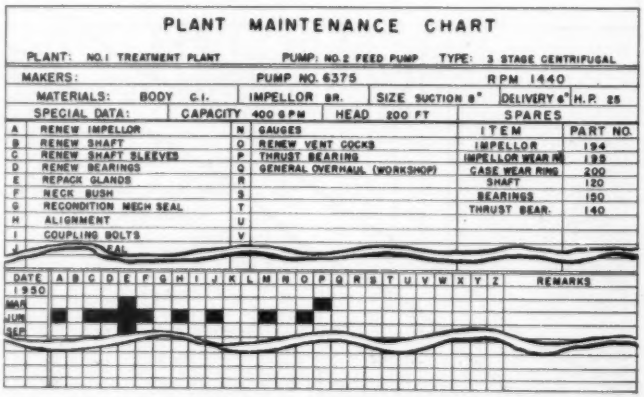


Fig. 2. Typical maintenance chart kept, with minor variations, on every piece of equipment. It gives pertinent data, part numbers of spares and a graphic record of maintenance work done over a period covering the life of the machine

RICHARD H. MORRIS was educated at the University of California and Massachusetts Institute of Technology. A marine machinist before entering college he has had wide experience in all parts of this country and in Mexico and Europe as a surveyor and as a marine, mechanical, electrical, plant and industrial engineer. He is a veteran of both World Wars and currently holds a commission and mobilization assignment in the USAFR as lieutenant colonel. He has been editor of Plant Engineering since release from military service late in 1947. He is a registered professional engineer in the State of Illinois and also a member of many societies.

The Plant Engineer in the U. S. A.

A review of the development, organization and responsibilities of the American plant engineer against the background of industrial development over the last three decades . . . He developed as industry grew

By RICHARD H. MORRIS

FURNISHING as he does the essential services to keep industry operating, the plant engineer has certain basic responsibilities common to all plants, to all industries and probably to all countries.

The relative position of the plant engineer on the management ladder is, however, less a matter of size, location and product than of industrial development. The more primitive the industry, the more lowly the plant engineer. Conversely, the more advanced the industry, the higher the status of the plant engineer.

Industrial Development

As we know it today, modern American industry is relatively new so that plant engineering, which developed as an integral part of that industry, is of necessity new. Over the years it has developed from the craftsmanship to professional status in order to meet the complex technical requirements of modern industry.

It is therefore desirable first, to paint in broad strokes the nationalistic background of the American plant engineer and then, show where he fits into industrial operations, what he does, how his department is organized and some of his current problems.

Looking back a half century, the development of American industry, with the plant engineer as an integral part, has progressed through four phases: Phase I, The Classical Period which extends up to, and through World War I; Phase II, The New Economic Era, roughly 1920-1930; Phase III, The Depression Period, roughly 1930-1940; and Phase IV, The World War II Period, beginning about 1940 and still continuing.

While these four phases reflect the influence of economic and political conditions on the development of the American plant engineer, it does not touch on another development of great importance—industrial decentralization. There are two phases to this: physical decentralization and management decentralization. Management decentralization coupled with physical decentralization means more plants and more plant engineers with greater authority and responsibility.

All of these factors mentioned are interrelated as far as the growth and development of the plant engineer is concerned and all mean increased responsibility. To show the relation of the plant engineer to other activities, all engineering operations in a modern manufacturing operation may be grouped into four divisions: Research and development concerned with product design; manufacturing engineering concerned with methods and processes; industrial engineering concerned with labor, material and overhead; and plant engineering concerned with buildings, grounds, equipment and utilities.

While the degree of responsibility varies from plant to plant, there is a very definite trend toward the type of organization and activities giving the plant engineer complete charge of all supporting services in industry. In addition, the plant engineer has all the management, labor relation, personnel, cost and accounting problems of his own department. This all-around management experience, coupled with his knowledge of all departments of the plant, makes plant engineering an excellent stepping stone to top management.

The above outline of the American plant engineer carries no inspirational message. It is a factual story of the profession today, showing some of the best practices and some of the problems.

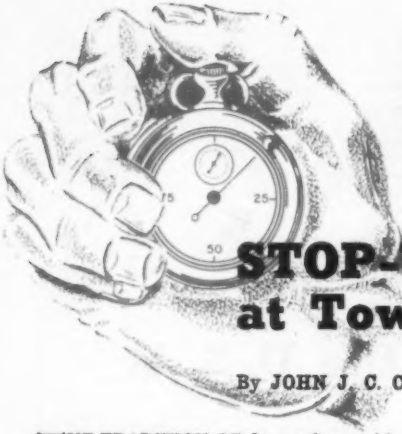
Possibly a few miles of ocean changes the fundamental character and interests of a plant engineer. We hope not, for we believe that fundamentally a plant engineer is a plant engineer regardless of nationality, with much the same problems, interests and degrees of skill. If this is true, the opportunity of international cooperation in advancing the profession is considerable.

Earlier, the possibility that certain nationalistic differences might influence practice was mentioned. It would be interesting to explore this point and perhaps as time goes on, work toward an international standardization committee to point out the best features of operating practice in each country.

Because plant engineering as a profession is relatively new in America we have little to contribute toward such a joint effort except enthusiasm, an insatiable curiosity as to the activities of plant engineers in various parts of our own and other countries, a deep interest in the profession, and a desire to find ways to do the job, easier, quicker, and cheaper.

COMPLETE COPIES AVAILABLE

This is a very brief summary of the complete paper which was reprinted, both in this country and England, for the Convention. The reprint, eight pages with nine illustrations, is available upon request. Write to the Editorial Department or write "IPE Preprint" on the post card.



Here's one plant engineer who uses a stop watch to prove lots of things to management . . . It's an instrument as precise as a micrometer, and its evidence is as irrefutable as a blonde hair on a dinner jacket . . . Here are two examples: In one, Plant Engineer Coffin proved how by spending money, money could be saved. In the other, he proved that spending money would be wasting it . . . It's language management understands . . . and likes

STOP-WATCH ENGINEERING at Towle Silversmiths

By JOHN J. C. COFFIN, Plant Engineer, Towle Silversmiths

THE TRADITION OF fine craftsmanship and enduring beauty of product had its American birthplace in New England. Many firms in this section trace their ancestry to the 17th century but, through native adaptability, artisanship, and engineering ability they have progressed to keep stride with younger firms in other sections of the country. Such a company is Towle Silversmiths of Newburyport, Massachusetts.

Producers of fine sterling tableware, both hollow and flat, for many years, Towle Silversmiths are, nevertheless, subject to the same economic laws as all manufacturing plants; they have to continue producing their usual good product but costs must continue to be cut wherever possible. The company's engineering research department, comparatively recent development in Towle's history, is adding its part to the pool of money-saving ideas. Here, however, we are concerned with the part plant engineering has played in cutting the costs of services, preventing waste of utilities, and seeing that as much as possible of the dollar's worth of energy arrives at the point of use.

Technique

Towle, although basically concerned with beauty in metal, has a sharp eye on the profit and loss columns. When plant engineering sees a chance to save a buck it has to prove to management here (as elsewhere) that the buck can be saved. At Towle we find the stop watch a most valuable tool. We have used them in a number of different ways.

1. To determine capacities of pumps and compressors.
2. To determine rates of flow or demand for various utilities such as gas, compressed air, water.
3. To measure quantitatively and isolate leaks.

We find a stop watch with the dial calibrated in tenths and hundredths of minutes more convenient to use, although the common second hand type is as satisfactory.

In using a stop watch on any process or operation it is first necessary to pick out the elements on which you want to get separate information and which can be conveniently recorded and timed. For example, the operation of an automatic control or relay, the starting or stopping of a motor, the rotation of a dial or pointer or an accumulating meter such as a gas, electric, or water meter.

In using the watch either of two methods of reading can be used depending on the nature of the job.

1. The *click-back* method is used where only one element or series of elements is to be timed. The watch is snapped back to zero after each element after recording the reading. With a little practice this can be done very rapidly and without any loss of time. This method has the advantage of giving a direct reading in decimal parts of a minute without further calculation.

2. The *continuous method* is used where two or more series of elements or cycles that take place more or less simultaneously are to be timed. The watch is allowed to run continuously and the events are recorded. The element times are found by subtraction of successive readings either during long elements or after returning to the office.

No doubt your own time study or methods engineering department can help you in learning to use the stop watch.

Air Compressors

CAPACITY — Our three air compressors operate under automatic control starting up or loading up when the pressure falls to 85 or 90 psi and stopping or unloading at 98 or 95 psi respectively. Using the continuous method of timing (as there were three compressors operating at once with overlapping cycles) we determined for a series of twenty or thirty cycles, the following times:

1. Total cycle time—that is the time from one start to the next start; 2. The loaded or working time; 3. The idle or unloaded time.

These figures were used to calculate for each cycle the per cent of the time and hence the per cent of capacity running loaded and idle. From the manufacturer's capacity ratings in cubic feet of free air per minute, we found our total demand and spare capacity as a percentage of total installed capacity. In our particular case we found that overall we had a net spare capacity of about 10 per cent. Since our three compressors were about the same size and vital to the continued operation of our plant, it was obvious that failure of any one compressor would cripple our production. It was not difficult to persuade management to invest in a new compressor.

Growth of Air Use

We had been making these checks over a period of years so that we could show how our usage of air had grown and could predict with some degree of accuracy our likely demand for several years ahead. On the basis of this prediction, we purchased a new compressor which gave us a 60 per cent increase in capacity, providing for continuous operation should any compressor be temporarily out of service and also providing for normal growth in air usage for the next ten years. In working this out we found the compressor manufacturer most helpful in comparing costs of compressors of various sizes.

DEPARTMENTAL DEMAND FOR AIR —We were fortunate that the various departments using air were operating on different work schedules. Using the same technique as above and knowing what departments were operating at a particular time, we learned the amount of air used by each department. While this determination is theoretically possible if the installed demand in each de-

Tabulated results of time studies on air compressors at Towle Silversmiths. Three compressors of equal capacity were tested

TEST No.	CONDITIONS	PERCENTAGE of TIME LOADED	CONCLUSIONS and REMARKS
1	Plant shut down—6 P.M. Compressor No. 1 only	30% (1 compressor)	Compressor No. 1 50% less efficient than No. 2 and Compressor No. 3 100% less efficient than No. 2 *Check condition* of valves and rings in No. 1 and No. 3
2	Plant shut down—6 P.M. Compressor No. 2 only	20% (1 compressor)	
3	Plant shut down—6 P.M. Compressor No. 3 only	40% (1 compressor)	
	Check of compressors No. 1 and No. 3 showed broken valve strips. After replacing with new strips each compressor ran 20% of time under above conditions. 7% of total capacity required to overcome system leaks.		
4	Plant shut down noontime—many machines left with air valves open. Compressor No. 2 only.	40% (1 compressor)	13% of total capacity to overcome leaks in system and machines. By difference, 13% — 7% or 6% of capacity for machine leaks.
5	Department A only running Compressors No. 1 and No. 2 running	45% each (2 compressors) 30% of total capacity	By difference, 30% — 13% = 17% Capacity for Department A
6	Department A and B running All 3 compressors running	40% of total capacity	By difference, 40% — 30% = 10% of capacity for Department B.
7	Whole shop running Departments A, B, and C All 3 compressors	90% of total capacity	By difference, Department C uses 90% — 40% = 50% of total capacity. 10% of capacity (100% — 90%) = Spare capacity

partment is known, such figures are too involved to work out if there are very many machines, and they do not take any account of the demand *factor*—(that is, the working pace of each machine and the individual machine cycle characteristics).

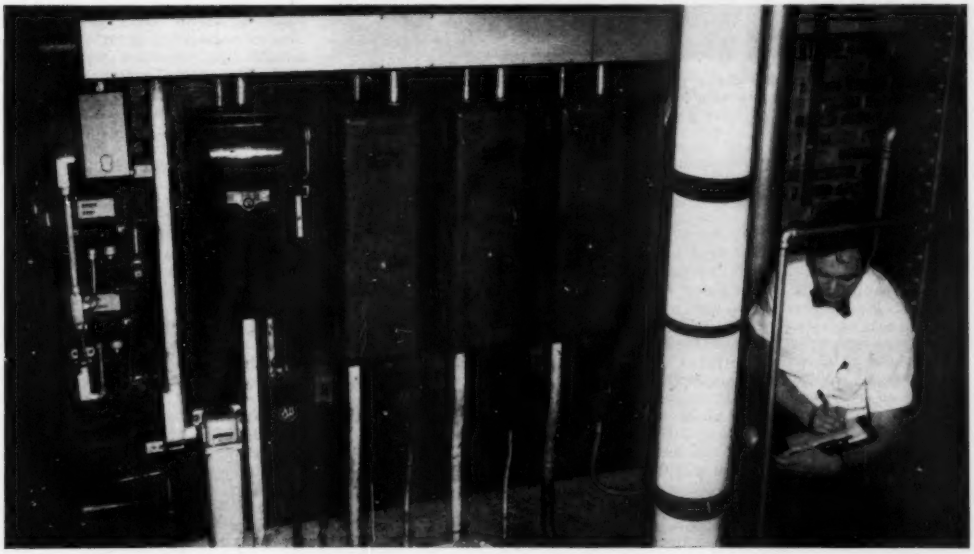
LEAK DETERMINATION—By timing the compressors at a period when the plant was shut down, we found that approximately 10 per cent of our total capacity was needed when no air operated equipment at all was running. In other words 10 per cent of our capacity was required just to overcome leaks in our air distributing system! Isolating various sections of the plant by closing section valves, we very quickly localized most of the leaks and were able to repair them without further loss.

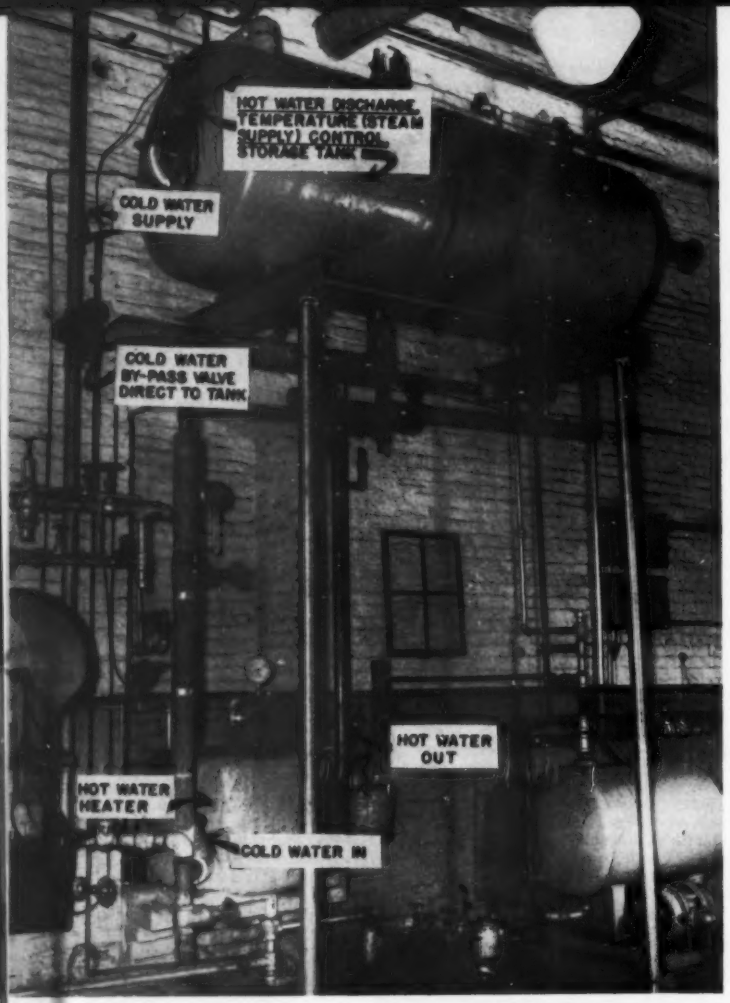
COMPARATIVE COMPRESSOR EFFICIENCIES—We were interested in finding out how our compressors compared with one another in efficiency. So we timed each compressor on a fixed load which did not fluctuate. Again we used a time when the plant was shut down. This eliminated any false conclusions that might be introduced by variations in loading of the compressors during regular working hours.

In Table I we summarize the results of the above tests.

We used the diagnostic qualities of the stop watch still further when we ran into water difficulties. To explain the background we shall have to go back to the end of World War II. At that time, an earlier period of material and equipment shortages, the company bought the only available indirect water heater. Its capacity was reputed to be about

Plant Engineer John J. C. Coffin, beside the compressor switchboard, compiling some of the figures published in this article




HOT WATER DISCHARGE TEMPERATURE (STEAM SUPPLY) CONTROL STORAGE TANK
COLD WATER SUPPLY
COLD WATER BY-PASS VALVE DIRECT TO TANK
HOT WATER OUT
HOT WATER HEATER
COLD WATER IN

Labeled photograph above shows the locale of the water heater. The author explains, in the article, how this hook-up effectively rid the plant of a water bottleneck and, at the same time, permitted extended use of the old water heater

10 gallons per minute but there was no other information available. It *was* a water heater though, so it was bought and installed.

At wash-up periods we have a peak demand for hot water that far exceeds the normal demand. At that time, even the cold water lines to the wash fountains refuse to give off more than a trickle. A certain school of thought sprung up in our plant which held to the theory that the water main, from the city supply, had become clogged or otherwise rendered useless and would have to be replaced. This would have entailed a lot of work, lost time and income, plus direct labor and material charges. So, a man sat down beside the main water meter and did some timing.

It was decided to time the water meter at various periods throughout the day, at known intervals of heavy demand. Therefore, if the time required for 5 cu. ft. to pass through the meter indicated that it was passing through at a rate close to the capacity of the pipe, the pipe could be considered to be in good shape.

Normal Consumption

Subsequently, using the stopwatch, it was found that normal consumption was 56 gpm; night wash-up was 83 gpm; and noon wash-up was at the rate of 104 gpm. It was at the noon time wash-up that the shortage of mixed cold and hot water became apparent. However, in the tool and die room we have a die quenching operation that requires large amounts of water in a hurry; in fact, during die quenching operations the stop watch man found that 156 gal of water were passing through the main meter per minute. The restriction in water flow, therefore, could not have been caused by the main line from the city meter.

The next step was to check the meter located ahead of the water heater. Plant Engineering had suspected that the bottleneck was located here but we could not prove it until we were sure that the main meter, and consequently the water main itself, was functioning at capacity.

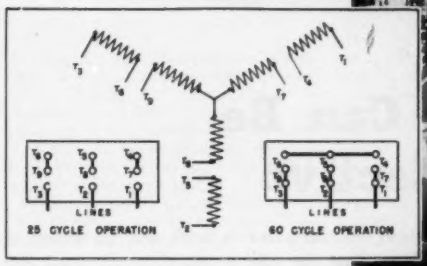
The Stop Watch Wins Again

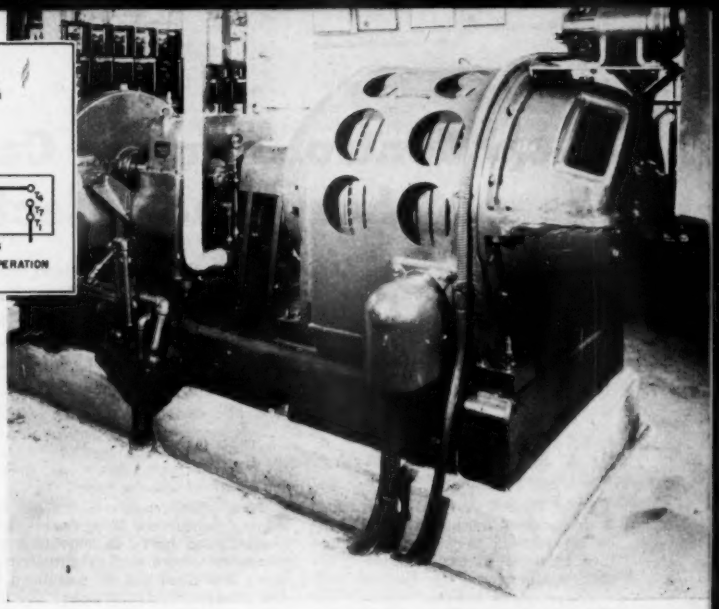
The stop watch showed that at 8:00 A.M. it took 0.40 min for 1 cu ft of water to pass through the auxiliary meter (approximately 18¾ gpm); at 4:00 P.M. it was nearly the same. At the peak wash-up period, 11:55 A.M., it took 0.25 min for 1 cu ft (30 gpm) to pass the meter.

Since the heater was supposed to be rated at 10 gpm, it looked as though this was the source of trouble. To confirm this we temporarily installed pressure gages in the water supply and discharge lines of the heater. Under normal conditions the two gages read approximately the same but at wash-up time there was a difference of between 20 and 30 pounds between the supply and discharge pressures. Here was our trouble spot. We were calling on the heater to deliver 300 per cent of its rating and it just couldn't do it. First it could not heat that amount of water and second, it could not *pass* that quantity whether heated or not.

The temperature regulators on the wash fountains were policing the flow of mixed water at the predetermined temperature; consequently, when the water heater under extreme demand was unable to deliver the hot water needed the cold water too was cut down. The remedy was a new and larger capacity water heater. Since this overload was of only 5 minutes duration once a day, we found that by opening the bypass around the heater we could avoid this expense.

Now, when the wash fountains call for water and the hot water supply is lagging, cold water simply rushes directly into the storage tank to keep pressure up to normal. We use the stored hot water to fill the peak demand. When we can find the right time and period to install a new heater this particular headache will be a thing of the past. The stop watch did prove, to the doubting Thomases, that the water main was in good condition; and in this instance it spared management an expense which would have been entirely unjustified based on the conditions actually existing.





Above: Diagram of generator connection for change-over from 25 to 60 cycle operation. Right: 100 kv generator at Johns-Manville's Canadian plant, converted recently to 60 cycle operation

Versatile Stand-By Power At Johns-Manville's Canadian Plant

BY J. L. MANGAN, Turbine Div., General Electric Co.

MANY PLANT AREAS now being serviced by 25 cycle electric power face an early change to 60 cycle power because of increased wartime needs. A generator set for stand-by power is one of the items that would be critically affected by the change unless consideration is given to the problem when specifying and designing the unit. With proper design, the change-over of a generator, from 25 to 60 cycle, can be made easily, quickly and inexpensively.

A turbine-generator at the Port Union, Ontario, plant of Johns-Manville Co., was originally set up for 25 cycle operation and has been converted to 60 cycle operation. Foresight on the part of Johns-Manville engineers in specifying a unit that could be readily converted saved time and money during the change-over and provided the plant with reliable stand-by power at either frequency.

The set consists of a single-stage steam turbine connected through a speed reducing gear to a synchronous generator with belt-driven exciter, all mounted on a fabricated steel base. For 25 cycle power, the generator is driven at 750 rpm. To change to 60 cycle operation, the generator speed is increased to 1800 rpm by increasing the speed of the turbine a proportionate amount. This only requires minor mechanical changes to the turbine and gear, reconnection of the generator windings, and changing the ratio of the belt-drive for the exciter. In this case, the cost of providing for the change-over, including the necessary parts, amounted to less than 10 per cent of the price of a set designed for 25 cycle operation only.

The turbine is a standard single-stage mechanical drive unit operating at 2080 rpm for 25 cycles and at 4980 rpm for 60 cycles. Since this change is beyond the adjustable speed range of the governor, the drive gears for the governor oil pump are changed for the higher speed. This gives better regulation than would be possible with one governor setup. Replacing the speed governor gears and resetting the overspeed governor for the new speed are the only mechanical changes required. Due to a gain in efficiency resulting from the increase in speed, less steam flow is required to carry the load at 60 cycles. By closing a hand valve, the nozzle area is decreased to that required by the new flow. This hand valve eliminates any need for rebuilding the steam parts. Opening a second hand valve provides extra nozzle area for operation with reduced steam conditions at either speed.

The close-coupled reduction gear is equipped with its own pressure lubrication system supplied by a positive displacement pump gear driven from the pinion shaft. When changing to 60 cycles, the gear ratio of the oil pump drive is changed to compensate for the increase in speed.

The four-pole generator is flexibly coupled to the reduction gear and is rated 100 kw, 125 kva, 0.8 power factor, 3 phase, 550 v at either 25 or 60 cycles. Sufficient leads are brought out so that, by reconnection, the stator windings can be properly distributed for either frequency. Each winding consists of four turns, and, as seen from the wiring diagram, they are connected two-circuit for 25 cycle operation and four-circuit at 60 cycles. The exciter, a 125 v shunt-wound unit, is mounted on the generator frame and driven by V-belts. This arrangement permits maintaining an exciter speed at 1750 rpm at either frequency simply by changing V-belt sheaves.

The necessary parts to make such a change-over consist of one set of governor drive gears, one set of gear oil pump drive gears, one V-belt pulley, and three V-belts for each frequency. Overspeed governor cartridges, pre-set at the factory for each speed, might be used in place of resetting the old one, particularly if change is not a permanent one.

Shop Control Centers Can Be Clean, Cheap and Effective

Give the shop clerk a clean, quieter place to work and his added effectiveness will more than offset the slight cost of really good surroundings . . . Units are glassed-in, ventilated, roomy and easy to build . . . They may be elevated or placed at floor level . . . Details of construction and arrangements for ventilation and heating . . . Information on the refinement of an intercommunication master set, and the construction and location of call boxes throughout the area

By A. M. ELLIOTT, Plant Engineer

PLANTS AS A whole, regardless of product, methods of processing or fabrication have a place where direct contact is made between the shop workers and the clerical staff.

These places, too often called "The Hole," (with justification) are intended as a control point for the recording of tallies, worker's time on piecework or day rate and machine loading schedules. The recording and control of jobs moved in and out of a department, or the flow of material back and forth are also cleared here. This job requires some one spot where the person doing it can keep his "tools" and do a great percentage of his work, which is writing.

It is usually only an oversight on the part of management to overlook completely the function and condition of these little offices. In many cases this shop clerk has more difficult tasks to perform than does his counterpart "upstairs." He or she must be fast and accurate. Fast, because he's down where time means money to men and machines. Accurate, because his or her errors fed through the latest and most expensive calculators, tabulators and electronic machinery in the main office will still emerge as mistakes.

Yet look at his surroundings. Either a hole in some dark corner, to save valuable production space, or out in the open prey to every discomfort generated by the operations going on around him. If not deafened by the racket he may be choked by smoke from the salamander nearby. Sometimes he is blistered by core-oven heat or sweltered in a steamer's humidity. Dust, cooking smells, paint spray or exhaust fumes are in his hair, over his records and under his skin. To move him away places a load on operations due to the time lost traveling between his booth and the job. Described here is a possible solution. It satisfies economies of space and time, builds morale and guarantees a better, more efficient clerical job.

Total space requirements for this control center are 25 sq ft and since there is no harm in elevating the structure where roof height permits, even this need not be sacrificed by the production department. The obvious problem of communication with the floor in such a case will be discussed further along.

Reference to the accompanying sketch will show the booth to be roofed over and glassed in on all four sides. Any features, of course, are optional and may be modified to suit specific shop conditions. This applies to door and service window locations as well.

Off the Floor

The floor has been elevated for two reasons. Plant floors are often damp and cold and, in the case of concrete, fatiguing. The increase in elevation gives the occupant "seeability" out over the plant floor and also brings him, in a seated position, more in direct line with the face of anyone approaching his wicket. This is an important consideration where shop noise is at a high level.

Measuring 5 ft by 5 ft inside, the flooring is a matter of choice from tongue and groove to rough subfloor with an asphalt tile or Masonite covering. If straight wood is used the lumber should be laid perpendicular to the door to permit easier cleaning and of course at right angles to the foundation of 2 by 12's, shown.

As with our economical shop offices (PLANT ENGINEERING, August, 1950) the panels of ¼ in. 3-ply wood are framed in 5/4 stock and fastened to the raised floor with angle straps. The straps are made from 6 in. by 1 in. by 3/16 in. cold rolled or mild steel bent 90 deg with legs approximately 4 in. by 1½ in. in length and suitably drilled and countersunk. The sub members need not be fastened to the shop floor proper. A floating structure has a certain give which will better withstand any bumps that may occur from a misguided lift truck. Too, where neighboring machinery sets up a vibration or hum, rubber strips may be placed underneath to isolate the whole office from the concrete.

The panels overlap and are in turn overlapped by their neighbors so that they may be screwed into each other at the corners. The interior of the office is 7 ft 0 in. tall and the wainscoting is 36 in. to the bottom of the glass. Windows are 42 in. high and of various widths to fit a minimum side framing, and dividers of 3 in. Two of the panels are interchangeable and their location, (shown on the sides in the sketch) is purely a matter of where the door wall is placed in relation to the service window. This latter opening is 18 in. high by 15 in. wide with an up and down sliding glass closure. This may be framed or not depending on the thickness of glass used.

Not shown, for fear of obscuring other details, is the sliding door mounted on the lightest track available at your nearest hardware. Since the doorway is 27 in. wide by 6 ft 6 in. high, the door should be at least 79 in. high by 29 in. wide for adequate coverage. There is sufficient room for inside hanging and this will place the door within reach of the occupant at all times.

The built-in desk shown may be of any shape desired for the operations to be performed. In this instance it was cut from one piece of 10-ply wood and covered with a waxed Masonite sheet. The front is a 21 in. square and curved to the left ledge. From here it projects towards the doorway another 21 in. and 12 in. out from the sidewall. The shelf to the right is 48 in. overall (or 27 in. longer than desk depth) but is only 7½ in. wide to permit access to the drawer that may be seen hung below the calculator. This whole shelf, as well as any other that may be installed, (especially below the left projection)

is mounted on standard hardware shelf-brackets. In addition, two legs are set 10½ in. each side of the desk centerline. Behind the one leg showing in the sketch may be seen a footrail 21 in. long raised slightly from the floor. This has been found a great fatigue reducer.

Adequate electrical outlets should be provided in the corners on either side of the service-window for the time - clock, intercommunication master set, fan, calculator if electric, and desk-lamp. This, not shown, is deliberately installed, instead of a ceiling fixture, to increase the range of vision into what may be darker shop surroundings and to concentrate the light at hand. Furthermore, we have a better use for the uncluttered ceiling.

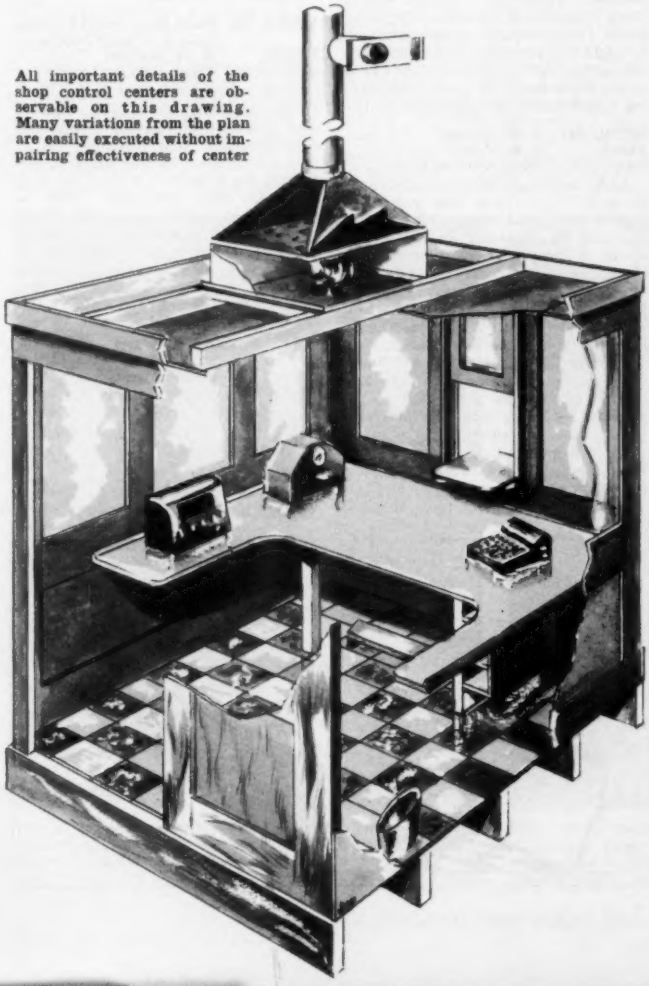
The service-window shelf, 6 in. above the desk top is 15 in. by 9 in. and projects an equal distance both in and out of the booth. Both side-wall glass areas may be omitted if operations require some wall space for machine loading racks, schedule boards, or similar items.

On the ceilings, 2 by 4 joists on 20 in. centers are fastened to the panel tops and 1 in. by 6 in. face-boards run around their sides and across the ends for strength and finish. From the inside, wall-board, plywood, Masonite or other suitable covering is fastened to these joists to give a flat unobstructed ceiling.

Now that the clerk is shielded from dust, heat and noise, some provision must be made for providing him with fresh air. To do this a stack of 4 in. diameter galvanized pipe, similar to gas stove venting, is run straight up to the roof from the ceiling center and above the roof to whatever height is necessary to clear the drift from any nearby exhaust openings or smokestacks.

If this height is considerable, some of the weight of the stack should be borne by the curb box built over the roof opening. If not, the total can safely be carried by the 1 in. by 1 in. by ⅛ in. angles bridging the center joists and fastened to the plenum, filter and blower housing.

The length and width of this box is dependent only on the dimensions of the 1 in. thick (or in extreme dust areas, 2 in.) furnace filters. The height of the box will be governed by the blower plus, of course, slide room for the filter. Above that the square to round slope should be steep to encourage full filter area usage from the start. Since our cubic content is small, (175 cu ft) a dependable make of furnace blower will give ample air and long trouble-free service.



All important details of the shop control centers are observable on this drawing. Many variations from the plan are easily executed without impairing effectiveness of center

Air Diffusion

Not visible, because of drawing limitations, is the air diffuser. This consists of a flat cone 36 in. in diameter by 4 in. high, with its point downward, located in the center of the booth directly under the blower discharge hole. Its base is 2 in. all around from the ceiling, giving the apex a distance of 6 ft 6 in. from the floor. The direct discharge of the blower would be too great and create a draft. Rigged in the manner described, the velocity is slowed down and distribution is generous; all corners are scavenged regardless of whether the door and window are open at the same time. The occupant should be warned to leave his window open at least a crack to permit a discharge of air. Conversely, too large an opening will destroy the positive pressure which keeps out a lot of dust.

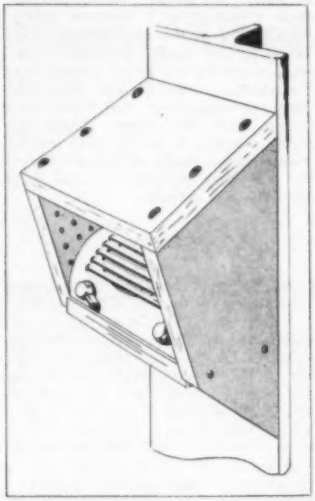
In winter, to shut off the cold outside air, the horizontal blast gate across the stack (well up close to the roof where the air is warmest) should be closed and the one on the side opened. If the shop surroundings are smoky this line should be run to an uncontaminated source. If it passes over a hot zone it could be led outside. On the other hand, if the atmosphere is only dusty the filter will take care of this and a mixture of outside and inside air is always possible.

Incidentally, in those areas where high winds are prevalent, the uptake or suction at the top of the stack may be sufficient to decrease the efficiency of a low pressure or weak blower. Should this happen a cap, like an inverted tomato can, may be dropped over the top of the stack to correct this. The cap should be greater in diameter than the stack by an amount equal to the stack area. It should be mounted a distance above the top equal to 2 diameters. In other words, for a 4 in. stack the can should be approximately 5¾ in. in diameter, it should be 16 in. long and come down over the opening 8 in.

An eggshell white ceiling, two-tone blue dadoed to the bottom of the windows will finish the job up

right. Remember you encourage or discourage the job you want done by the surroundings you provide.

As to the intercommunication master set—this is a refinement that



Made from discarded pieces of acoustic ceiling material, this call box booth will permit easier, more audible conversation when noise is at a high level

bears investigation. In many plants, departments cover vast areas necessitating long walks on the part of any personnel finishing up a job and wanting to check out on it or be told of a new one. The time thus consumed is expensive. In the case of a 6 man crew, 3 manhours can go up the flue in short order.

This lost motion can be eliminated to a great extent by placing call boxes or intercom units throughout the department. They cost very little; $120.00 will purchase 5 stations and a master from which all the power emanates. Once installed, troubles of this sort should be at an end. In fact after twelve months' operation the first such unit installed by the author has been reported to have had zero in the way of repairs.

The booth (called the "Tower") where I made this installation is hung from the roof with its floor nearly 8 ft above a very live production area. The combination saves space as well as a lot of steps for concerned shop personnel. Since, as in this case, a great many work places have a high noise level a description of the means of overcoming this condition may prove of value.

The "call" centers are mounted on the building columns and shielded by pieces of standard acoustical tile left over from an office noise-suppression job. Three pieces are used for a top and two sides. The unit itself is set on a shelf, made in the sheet metal shop of ⅛ in. plate welded to size and bolted on the 8 in. H column approximately 5 ft from the floor. To its side and across the top are fastened the three pieces of tile. The lid, besides completing the noise guard, serves to keep settling dust out of the mechanism.

In an extremely noisy spot, where the pressure from sound waves is so intense a speaker feels as though he is simply moving his mouth and no words are coming forth, more suppression coverage is necessary.

An instruction sheet, showing a sketch of the unit, with a conspicuous arrow indicating the operating button, is posted below each unit so that the announcements will be uniform. These state simply: "1. Press down lever on left shown by arrow. 2. With your mouth about 12 in. away and speaking not too loudly say—'Station 3' (or 2, 5, 4 or whichever it may be). 3. When 'the Tower' acknowledges, no further action on your part with the lever is necessary as both sides of the talk can be handled by the operator. 4. Give your payroll clock number and name, job you are finishing and next job to be started."

No cases of mike fright have been reported to date and observation indicates the whole performance takes less time than reading the above, as the operator soon gets to know individual voices and recognizes the correct station even when identification is forgotten. Further details of just how these booths, their location and operation can be utilized save manhours, clerical work and duplication of effort while giving centralized positive control will be discussed in a future article.

Plant and Office Layout

DURING SOME hectic days in December, while our various offices were scrambling for additional filing space, a contretemps[1] occurred which brought the situation to a head. The following duel of memos shows how much the travail[2] of plant engineering departments is appreciated.

MEMO TO: A. W. Kramer
FROM: R. H. Morris
SUBJECT: Filing Cabinet Space

Your memo of December 26th says in part, " . . . Now that you have solved that problem so practically, you can figure out how I can find about 4 rows (of filing cabinets) more for expansion." "That problem" concerned the consolidation of Power Engineering's photo file and data file, a family unit ruthlessly torn asunder some days earlier.

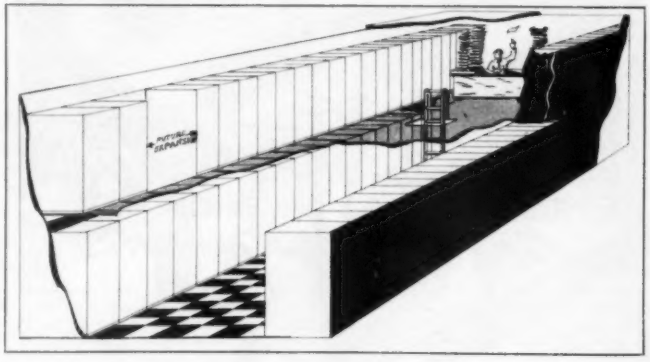
Your present problem of additional filing space is not difficult and was readily solved by the Plant Engineering Planning and Layout Section. There is plenty of room in your cubicle but the present arrangement does not utilize the space, particularly the air rights, well. It violates all the principles of good salt mine layout, particularly No. 1, "Waste No Space," No. 2, "Utilize Overhead Space," and No. 3, "Mechanize." R.H.M.

MEMO TO: Plant Engineering Planning & Layout Section
FROM: A. W. Kramer
SUBJECT: Filing Cabinet Layout

Your alleged solution to the filing space problem has been received and given most careful study and consideration. My comment on it, in a memo such as this must be reserved since memos, to comply with accepted office etiquette, must be couched in polite language. First, the drawing is good—excellent, in fact. It complies with the laws of perspective, and seems to have been executed with the diligence that might have been given to the delineation of a *practical* idea.

The second element of merit involved in this solution is that the mental effort expended was, by virtue of its employment on this relatively harmless project, thus diverted from doing irreparable damage to some really worthwhile enterprise.

[1] French for "mishap," I think.—Ed.
[2] Latin for "work," I hope.—Ed.



When You Want Flexibility —Put the Plant on Skids

Western plant puts all machinery on skids to meet production line requirements of different jobs . . . Color code on all columns indicate availability of electricity, compressed air, water and fire outlets . . . Cranes, lift trucks and flat-bed trucks on rails meet transport requirements . . . Steel plate inside storage saves labor, avoids rust

FLEXIBILITY of production facilities is a major factor in most plants. It has been developed to the utmost in the $800,000 plant of the Puget Sound Sheet Metal Works at Seattle, Wash. Here the speed and economy of assembly-line methods have been gained in the custom fabrication of a wide range of products for western industries.

Free Material Movement

First, in the effort to achieve flexibility in this plant of 70,000 sq ft of working space was the desire to provide for free movement of materials, work in progress, finished products and the metal-working machinery itself. Every machine in the plant, except for the heaviest units such as the 16 ft power brakes, is mounted so that it may be moved in order to set up, or alter assembly lines to meet the production problem of the moment.

Machines normally bolted to the floor are mounted on heavy steel I-beams. These assure a steady, secure position, no matter where the machine is placed. The entire floor of the building is 5 in. reinforced concrete designed for a floor load of 3,000 lb per sq ft. This provides an adequate base for machinery anywhere in the building. Overhead cranes, with craneways are designed for 30 t loads, operate over these craneways for a total of 800 ft.

Heavier machines are moved with the overhead cranes. Lighter machines are transported by 2 t fork lift trucks. Custom fabrication work does not lend itself to a fixed assembly line production so flexibility of the machine to meet the requirement of a specific job was devised as a practical solution to the manufacturing problem.

This spotting of machines is further facilitated by plant-wide distribution of compressed air, electric power and water. Outlets for these utilities are conveniently located on columns and locations are identified by a color code.

Color Coded

A broad band of green paint on a column just above eye level denotes an air outlet. Blue indicates electricity, white means water is available, and red stands for fire-fighting equipment. Two and usually three of these color bands appear on every column. This provides a wide latitude in locating machinery, as well as in the use of portable welding machines and hand tools, both very important factors in production.

Fig. 1. Supplementing the cranes and lift trucks are these transfer trucks. Operating on roller bearings they are easily pushed by hand. Note the use of the yard crane, a very useful device for handling either inside or outside the plant

Fig. 2. Color codes on every column show where compressed air, electric power water or fire outlets are available. These codes make it possible to move machines where dictated by the immediate needs and changing production requirements

Fig. 3. This company has found out that inside storage of steel pays off in decreased cost of inventory records, increased availability to the job when required and decreased losses due to rust and necessity for cleaning metal before use

Compressed air is carried through a grid of underground piping from two Worthington compressors. Overhead conduit was used for electric power wiring in the interest of reduced maintenance costs. Electrical power is available from a 480 v network. There are many 60 ampere, three-wire, four-pole welding receptacles and three-pole grounded receptacles for tools.

Movement of materials, tools and products throughout the plant is facilitated by an extensive system of transfer tracks which supplements the overhead cranes and lift trucks. These tracks, imbedded in the floor, run between bays in the main building and out into the yard area.

Flatbed transfer trucks which run on these rails are equipped with anti-friction roller bearings to make it practical for one man to push most loads by hand. Only in exceptional cases is a truck or crane called upon to tow a transfer truck.

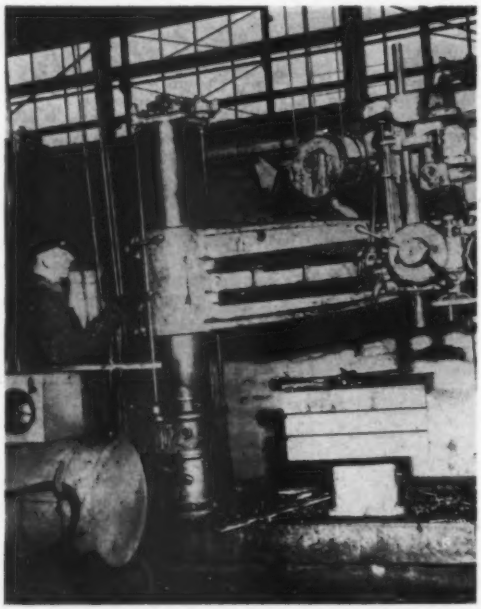


Fig. 4. With the chips still hot this stalwart individual doubles in brass helping the craneman guide his hook to move the machine to a new location. He knows that locating a spot to plug-in his welding machine is now an easy job

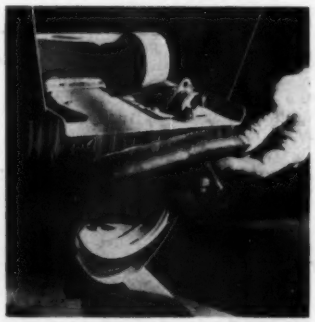
Inside storage of steel plant is another feature of the operation. Two railroad spurs enter the building. Steel plate is unloaded directly into upright storage bins, all marked and numbered as to gauge and dimension. This facilitates keeping a running inventory of stock, easily verified. It has been the company's experience that inside storage pays for itself in time and labor because material is close to the job and the men work with clean material free from rust.

Squaring the Circle

PLUGGING a round hole with a square stopper has long been the classic example of hopeless endeavor. Boeing tooling engineers recently were handed an assignment that was equally tough—plugging a hole both round and square.

It was a doughnut-shaped hole with one square side in the Stratojet's vertical stabilizer. It was required because the hot-air anti-icing system in the stabilizer's leading edge has to be tested for pressure before the stabilizer can be attached to the dorsal fin of the fuselage. This anti-icing passage must be closed off while the test is being made. After that the plug is taken out and used on the next stabilizer in the production line.

The engineers decided that some sort of inflatable inner tube would serve as a good plug—if one could be built so it would bulge only around its inside and outside edges, where they touched the D-shaped hole and the duct inside the hole. They thought it should be shaped exactly like the opening, that it



D-shaped rubber plug used for testing pressure in anti-icing system is Boeing's answer to problems of a square circle

should be hollow and about an inch thick. Then, fitted with a tire valve, it could be inflated so its outer and inner edges would seal the hole perfectly. To keep the plug from bulging anywhere except around its edges, tie bars of rubber were fastened inside, between flat surfaces.

The engineers adopted the method, using high-temperature-curing rubber that could be laid into the die in sheet form, which proved very successful. The plug was built up—bottom surface, sides, tie bars, and top surface—inside the die with the valve and all parts in place. The sheet rubber adheres to itself wherever it touches, thus providing enough support to hold all the parts in place. Inside the die, the plug was inflated to 40 lbs pressure and cured for half an hour at a 300 deg temperature. This method produced a pliable plug with walls of uniform thickness.

Portable Electric Tools

II—Proper Grounding, Careful Checking of Parts

IN USING PORTABLE electric tools, not only must the danger of falls, strains, cuts, bruises, eye injuries, etc., be guarded against, but also those of electric burns and shocks.

It is especially important that users of portable electric tools know of the dangers of so-called low voltage electricity. There is a widespread belief that 110 volts is harmless. Nothing could be farther from the truth, as attested by the many fatalities that have occurred on 110 volt circuits. People have been killed by even lower voltages, and severe shock may occur at voltages as low as 25, if conditions of large areas of wet skin and prolonged contact with the electric circuit are present.

Since fatal electric shocks have resulted from accidental contact between a power wire and the metal frame of the tool, it is important that the tool frame be grounded. This will then prevent the "charging" of the tool frame through contact with one of the power wires, since the circuit fuse will blow, under normal conditions, and break the power circuit to the tool.

Dangers of Static

Tool frames can become charged in other ways also. Metallic dust and chips that find their way inside the tool through the ventilating openings, as well as copper dust that wears from the surface of the motor commutator, may provide a current path from the power circuit to the tool frame.

Static electrical charges can build up on the frame of portable tools and result in shock or the generation of a spark unless the tool frame is grounded, thus providing a path over which static accumulations can leak away.

Several methods are in use for grounding portable tool frames, some being much superior to others, but all depending for their effectiveness on the constant maintenance of good grounding connections. This will be treated later in the article.

One of the best methods of grounding is the use of a three-wire power circuit cord on the tool (a four-wire cord if the tool operates on three-phase current). A multi-contact polarized plug is attached to the end of the cord, as shown in Fig. 1, and this connects into a similar receptacle.

With this arrangement the tool frame is automatically grounded when the cord plug is inserted in the receptacle. This serves to eliminate the chance of forgetting to connect a ground wire to the tool.

Where extension cords are used to supply power to the tool at a distance from the receptacle, each of these must be equipped with the same kind of plug as the tool cord. And a cord receptacle having the proper number and type of contacts, as shown in Fig. 2, must be attached

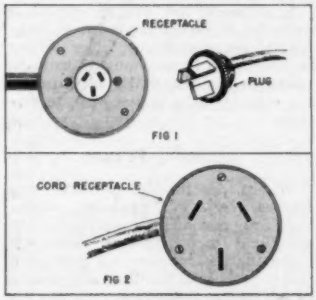
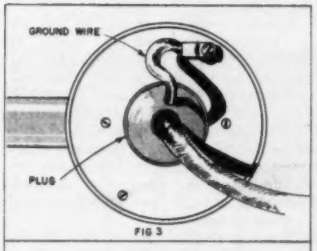


Fig. 1. A multi-contact polarized plug is one method of safe grounding. Fig. 2. When extension cords are employed the same type of receptacle is used



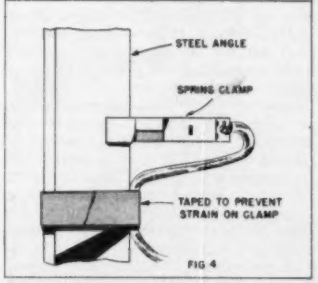


Fig. 3. The ground wire of three- or four-wire cords is fitted with a terminal lug for attachment to the receptacle box for grounding or, as in Fig. 4. a spring or other suitable clamp for fastening to a grounded metal object

to the other end. This insures continuity of the ground circuit from the receptacle to the tool frame.

When this method of grounding is employed, it is essential that the proper type of polarized plugs and receptacles be used, for if the same design of three-contact plug is used on ordinary single-phase tools as is employed on three-phase tools or other portable machinery, the frames of such single-phase tools will become "charged" when the plug is inserted in a three-phase receptacle. Polarized grounding plugs and receptacles, as their name implies, are designed to insure the maintenance of the polarity of the power and ground circuits, and should never be used on ungrounded connections or circuits.

Polarized Connections

Of course, portable tools equipped with polarized connections can be used only where the same type of polarized receptacles are available. Therefore, in order to provide grounding protection to tools used on construction jobs and in other locations where polarized receptacles are not provided, a method is used whereby a grounding conductor is provided in the power cord, in the same manner as for polarized connections, but is not attached to a polarized plug. See Fig. 7.

The third or ground wire passes through the side of the cord plug, which is equipped with two contacts and fits all ordinary type two-contact receptacles. In the case of three-phase tools, a four-wire cord is employed, but the plug has only three contacts, the fourth or ground wire having no electrical connection to the cord plug.

The ground wire of these three- or four-wire cords is fitted either with a terminal lug for attachment to the receptacle box, as shown in Fig. 3, or with a spring or other suitable type clamp, as shown in Fig. 4.

When making grounding connections in this manner, it is important that they be made securely, and that the metal to which the grounding lug or clamp is attached be a satisfactory and adequate ground. Usually a conduit, water pipe, metal building frame, or a pipe or rod driven into moist ground will suffice. However, it is best to consult the plant electrician as to the proper ground.

Be sure the surface to which the grounding connection is made is free from paint, grease, rust or any other non-metallic coating. If not, scrape

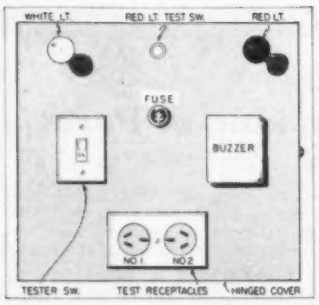


Fig. 5. Exterior appearances of a simple tester which may be installed in a convenient location close to the tool room so tools may be checked properly

or sandpaper the surface to the metal.

Where a water line is used for the grounding connection, check to see that any water meters in the line are provided with a wire jumper connection to insure continuity of the ground.

It is sometimes necessary to provide an extension wire to permit the grounding wire of the tool cord to reach a suitable ground. In such a case, see that the extension wire is of sufficient size and that it, too, is equipped with satisfactory grounding clamps.

Another method of grounding, employed where the portable tool is equipped with a cord having only two wires, consists of a separate wire, outside, and preferably securely taped to the tool cord. One end of this wire must be attached properly to the tool frame, and the other end fitted with a suitable grounding terminal or clamp. This grounding method, while better than none, is not to be recommended unless it is impossible to have the tool equipped with a cable having a built-in grounding wire. This is because of the obvious danger of breakage of the grounding wire attached to the cable, with consequent interruption of the grounding circuit.

Grounding wires should always be at least 1 in. longer than the power wires at both the plug and the tool; longer is better. This serves to prevent possible breakage of the grounding wire when strain is imposed on the tool cord.

It is especially important that the grounding wire be always connected correctly at both the tool end and the plug end. Any wrong connection at either end could cause the tool frame to become charged. The modern practice is to employ a green colored wire as the grounding wire. But in some older installations a different color may have been employed. For this reason, it is always advisable to carefully check the ground wire connections, and preferably ring out or otherwise test them for continuity, since one color may have been employed at one end of the cord and another at the opposite end, due to splicing of cords of different color combinations.

Any auxiliary equipment, such as noise filters, used with portable electric tools must be grounded in the same manner as the tool frame.

Where portable electric tools are employed in damp or wet locations, or inside or on tanks, boilers, etc., special care is necessary to avoid dangerous shocks and burns. The use of low voltage tools is recommended in such locations. These tools operate from a special low voltage circuit or through a step-down transformer provided for each tool. Such low voltage circuits and the low voltage side of the step-down transformer should not be grounded, thus making it necessary for two separate grounds to occur in order to produce a shock hazard.

If a special low voltage circuit is provided to power low voltage tools, special plugs and receptacles should be employed throughout in order to eliminate the possibility of connecting such tools to higher voltage circuits.

Insulated Frames

Where practicable, portable tool frames made of insulating material are considered equivalent to grounded metal frames. The use of insulating handles on grounded metal tools is a worth-while means of additional protection.

Other means of additional protection where portable electric tools are used include rubber gloves, rubber boots, rubber mats and insulating platforms.

Special tools are available for use in hazardous locations, such as where moisture, explosive gas, vapor and/or dust is present. The requirements of the National Electrical Code, the National Electrical Safety Code, and other authorities should be adhered to where portable electric tools are used in hazardous locations, and the particular dangers involved should be given careful consideration.

Since it is often necessary to employ an extension light when using portable tools, it is well to mention that all the applicable precautions as to grounding and other protection apply equally to extension lights. These are every bit as dangerous as portable tools. Only those especially approved by the proper authorities should be used in wet or otherwise hazardous locations. Extension lights operating from special low voltage step-down transformers should be used in locations where low voltage tools are recommended.

All portable electric tools should be equipped with safe operating switches. Such switches operate the motor only while the switch is held in closed position. These switches should be properly shielded to prevent accidental operation.

Switches that can remain in "on" position without hand pressure are unsafe, since the motor may start accidentally when the tool is connected to the power circuit or after a current interruption.

Connecting power cords used on or with electric tools should be of a type approved by the National Electrical Code. Improper types of cords or cords not properly cared for, may cause shock, burns, injuries, flashes or fires, and explosions in areas where flammable vapors or dusts are present.

Cords should be handled carefully and should not be subjected to mechanical abuse. Oil and chemical-resistant insulation is advisable on such cords, as rubber insulation may be damaged or destroyed.

Cords should be firmly anchored at both the plug and the tool or receptacle end in such a way as to prevent any strain being imposed on the wires or terminals. This is generally accomplished by means of properly designed clamps.

To facilitate handling and storing of tools, and to provide a conveniently close means of disconnecting cords, it is frequent practice to have the tool cord only 3 to 5 ft in length. This is extended by means of an extension cord when the tool is in use.

Defective cords should never be patched or taped. Either the defective section should be removed or a new cord provided.

In order to maintain portable electric tools in as safe a condition as possible electrically, it is essential that they be inspected, tested and repaired at regular periodic intervals. A satisfactory plan to adopt is as follows:

Each time a tool is returned to the tool room, test it for grounds, ground continuity and operation. This may readily be done by the tool room attendant if a simple tester is installed

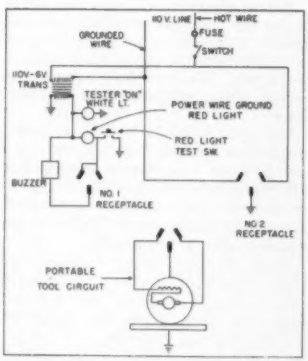


Fig. 6. Wiring diagram of the tester shown in Fig. 5. Testing of tools before they leave the tool room, and in front of mechanic who is to use the tool, gives him confidence in its condition and increases his safety consciousness

in a convenient location adjacent to the window or counter.

This tester, shown in Fig. 5, and diagrammatically in Fig. 6, permits tests to be made in a minimum of time. Returned tools are placed on a metal plate (or the counter if the counter is covered with a metal plate top), the cord plug inserted in No. 1 receptacle, then in No. 2 receptacle. If a buzzer sounds upon insertion of the cord plug in No. 1 receptacle, this indicates that the grounding wire in the cord is continuous from the plug to the tool frame. Should the red pilot lamp light also, however, this indicates that a short circuit exists somewhere between the power wires and the

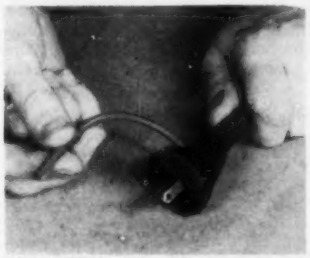


Fig. 7. Where polarized receptacles are not provided, as on construction jobs, this grounding protection may be used

frame of the tool, and the tool should be tagged for repairs and sent to the electrical maintenance shop.

If only the buzzer sounds upon insertion of the cord plug in receptacle No. 1, the plug should then be inserted in receptacle No. 2 and the tool switch employed to determine whether the motor operates satisfactorily. If the tool passes this test, and a visual examination fails to discover any faults such as damaged cord, broken plug, etc., it is returned to stock. But if any defect is found, or it fails to operate properly, it is tagged for repairs. The extension cord or cords, if any, should be connected to the tool when the tool is tested.

A white pilot lamp on the tester shows when the tester is turned on. A toggle switch permits the tester to be turned off when not in use.

A test switch provided on the tester permits the red pilot lamp to be periodically tested, to insure its not being defective and thus failing to indicate a short circuit between the power circuit and the tool frame.

This tester can be constructed of a regular steel outlet box of suitable size and shape and having a hinged lid. The box is grounded through the BX or Greenfield of the power circuit. The paint should be removed down to the bright metal wherever ground connections are made, including the BX or Greenfield. The transformer and all wiring connections are inside the box wherever possible.

Floor Conveyor Trims Handling Cost a Third

$20,000 investment at Seattle freight terminal reduces handling costs a third with more expected as routine smooths out . . . 716 ft of dragline conveyor and 325 trucks serve rectangular area

ONE WAY to cut costs on freight handling is told by the record of a new floor conveyor system installed in the Seattle, Wash., $400,000 terminal of Consolidated Freightways. The system, said to be the first of its kind, handles 71 carts simultaneously on a 716-foot rectangular course, 302 ft long and 50 ft wide, to serve both sides of the loading dock.

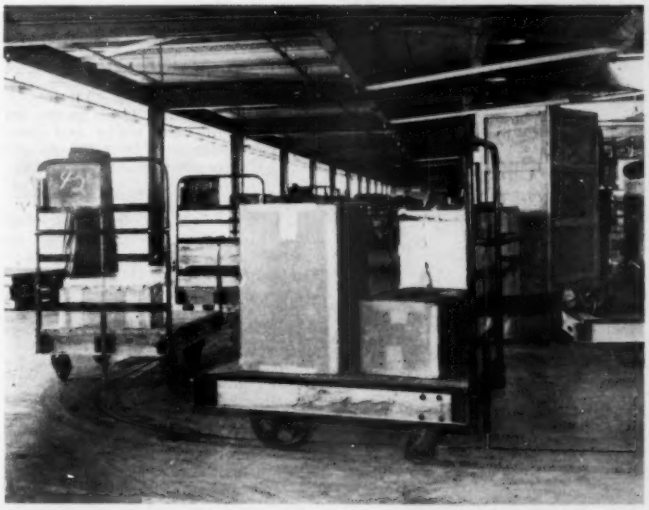
It was made at a cost of $20,000 and within a few weeks had reduced handling overhead by 33 per cent, with prospects of an additional cut in costs of 16 per cent when routine under the new system is smoothed out.

Included in the installation are 250 rubber tired freight carts, 50 trailer carts for long loads and 25 hand trucks for handling loads too heavy to be shifted easily so the carts. Carts have a capacity of 1500 lb each. Speed of the conveyor line can be regulated from a control panel over a range of from 150 to 180 ft a min, with 160 ft the normal rate.

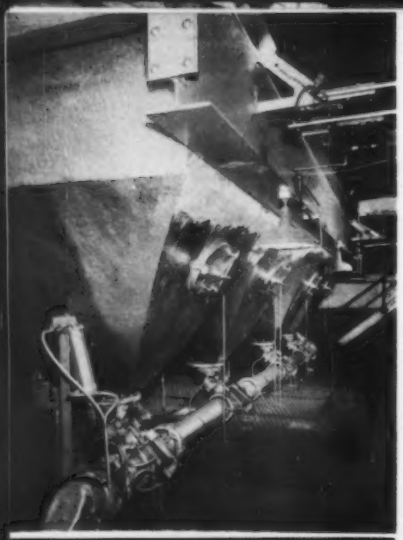
The Link-Belt conveyor is powered with a 7½ hp Adjusto-Spede electric motor and magnetic clutch for smooth starting after a shutdown. Two of the four turns on the rectangular course are fixed and two are adjustable, one a screw adjustment to take up wear in the chain, and the other spring-adjusted to compensate for load changes.

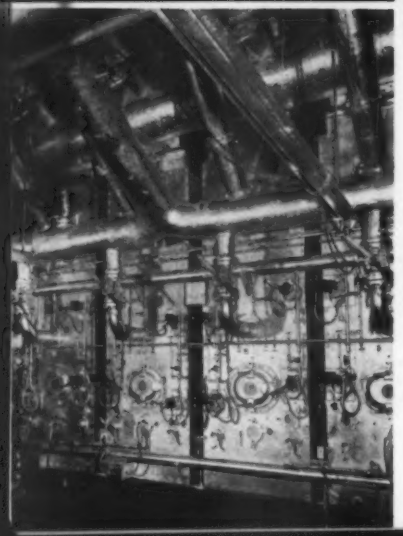
The loading dock is arranged so that local trucks are unloaded and loaded on one side and highway trucks on the other. To facilitate handling of freight between the two kinds of trucks, the conveyor line was laid out near the outer edges of both sides of the dock so that it serves not only to move freight lengthwise, but across the area by carrying it up one side and down the other. The space within the rectangle formed by the conveyor is for storing empty and loaded carts.

Truck loading bays are code numbered to indicate destinations and corresponding numbers are chalked on the carts in order that they may be picked off the conveyor at the correct point in the line.



The conveyor system encloses the terminal, and carts and freight are stored in the area inside the conveyor chain. The dragline travels at 160 ft per min and trucks are engaged or disengaged by pins which drop through the slot in the floor. Note the number chalked on the truck to indicate where to unload it





INSULATION

Plays Dual Role At These Plants

In addition to its principal function as a heat saver, says the Industrial Mineral Wool Institute, thermal insulation is frequently on the job to help make the plant a safer, more comfortable place in which to work . . . To maintain insulating efficiency on the job, insulation exposed to working areas is itself protected from possible damage by passing workers and equipment

THE PRIMARY FUNCTION of thermal insulation is to save heat and, in consequence, to reduce fuel cost, maintain process temperatures or to ease handling of fluid material. Another function of industrial insulation, often equally important, is to increase personnel efficiency on the job by making plant working conditions and operating areas safer and more comfortable.

There are three ways in which insulation helps to make work areas more comfortable and safer for employees. These are: Reduction of ambient temperature by cutting heat radiation from high-temperature equipment and surfaces; prevention of burns by accidental contact with hot surfaces; reduction of noise level.

The protection of employees in each of these three ways usually means that insulation is installed on equipment directly serviced by employees or on surfaces that are in or near frequently-used space. In power plants, cat walks and passages near boilers, heaters and air ducts are more often than not bordered by insulation covering heated surfaces.

There is always the possibility that insulation will be cracked or pitted by accidental contact by personnel and heavy equipment. Because it is often necessary for employees to walk on insulation to reach hatches, instruments, valves and other control points, the insulation must be protected by some means so that its outer surface will not be damaged. There are several effective methods of protecting insulation; among these are sheet-metal jackets, heavy plastic coats, special floor plates and other similar shielding and reinforcing members.

Engineers at the Long Island Lighting Company's Glenwood Power Station, Glenwood Landing, Long Island, have made it their practice to specify insulation in those cases where it is considered that the safety and comfort of plant personnel justify such an installation. Most insulation used here has been applied to cut heat loss from furnaces, boilers, heaters, air ducting (primary and secondary), piping and other high-temperature equipment. In a number of cases, however, insulation was installed where the reduction of heat loss was either secondary or entirely unnecessary.

The four dust collector hoppers in Fig. 1 receive fly ash from the combustion of fuel in boiler No. 6. The fly ash is emptied two or three times daily into the connecting floor pipe and conducted by a vacuum system to outdoor silos. The silos are emptied by trucks and the ash used as fill.

The fly ash is received by the dust collector hoppers at approximately 300 F and cools slightly in the hoppers before removal. The hoppers in Fig. 1 are covered with 2-in. thick mineral wool blankets and a 1-in. layers of insulating cement. In specifying insulation on the hoppers engineers were not primarily concerned with the prevention of heat loss from the ash, but felt that excessive heat radiation from the high-temperature sheet-metal hoppers into the plant could not be permitted. In addition, it was also necessary for employees to work near the hoppers and service the equipment below.

To secure the blanket mineral wool, 14-gauge iron wires were

Fig. 1. Top: These dust collectors are insulated with mineral wool blankets and insulating cement to prevent heat gain in the plant and protect employees. Fig. 2. Center: Another case of worker protection; the ash lines, at right of door, would be radiating at 350 F if it were not for the covering. Fig. 3. Bottom: This is an insulating job to cut down piercing shriek of gas as it rushes through pipe

welded to the sheet-metal surfaces on approximately 8-in. centers. The 24 by 48-in. blanket sections were impaled over the welded wires and butted tightly together to avoid gaps in the insulation covering. A slip-nut was placed over each wire against the metal lath on the outside of the blankets and excess wire was clipped at the nut. A ½-in. layer of mineral wool insulating cement was trowelled into the metal lath and over the slip-nuts and allowed to dry. A second ½-in. layer of cement was applied and, when dry, finished with two coats of aluminum paint.

Saves Personnel, Too

In Fig. 2, an 8-in. vertical pipe line is located directly on the right side of steps and a door connecting two sections of the plant. The pipe line contains ash, at about 350 F, being distributed from a boiler ash pit to outdoor ash silos. Prevention of heat loss from the ash is of little concern because the ash itself is waste and heat recovery is impractical. However, part of the pipe is no more than a few inches away from the steps and the hand rail on the right in Fig. 2. To reduce the possibility of accidental burns as employees walk up the stairs, the pipe has been insulated up to about 6 ft above floor level. Molded-type pipe insulation, 1½-in. thick, and a ½-in. layer of mineral wool cement cover the pipe. The insulating cement, in turn, is covered with a single layer of asphalt paper and 10-oz canvas which is glue-sized and painted.

Above the burners of boiler No. 4 in Fig. 3 is a T-shaped pipe section which supplies incoming natural gas, at a temperature of about 30 F, to the burners. Four small pipe sections can be seen connecting the horizontal gas line with the burners. Mineral wool felts, 1½-in. thick, and two ½-in. thick layers of insulating cement cover the T-shaped section of the gas line, not to reduce heat loss from the low-temperature gas, but to cut down the piercing screech of the gas as it rushes through the pipe. The shrill sound can be heard near uninsulated portions of the gas line and creates a condition difficult to work under. Directly under the T-section, the insulation has reduced the sound of the gas so that it cannot be heard above the usual plant noises.

The mineral wool felts, in 24 by 48-in. sections, were wrapped around the gas line and tightly secured with 20-ga wires circling the insulation on 8-in. centers. The applicators then wired a layer of 1-in. wire mesh over the felts and trowelled on two coats of insulating cement. A coat of asphalt mastic, ⅜-in. thick when dry, was trowelled over the insulating cement, glue-sized and finished with two coats of aluminum paint.

Not far from this plant is the new Glenwood Gas Plant where mineral wool insulation also is doing a job in protecting plant personnel from accidental contact with high-temperature equipment. Fig. 4 shows the exposed portion of an exhaust duct carrying waste gases away from a boiler. The motor on the left side of the stack drives a fan which draws the hot gases through the duct out to the surrounding air. The gases are at temperatures between 600 F and 700 F and the heated sheet-metal surfaces of the duct are a potential danger to maintenance men who often are on the roof to service cracking furnaces, motors and the induced-draft fans.

Mineral wool blankets, 2-in. thick, a ⅝-in. thick layer of insulating cement and finishing cement cover the fan housing of the duct to about five feet above roof level. The top portion of the stack is high enough to be left uninsulated.

The mineral wool blankets were secured to the sheet-metal ducting by welded wires approximately 3 in. long. The blankets, with wire netting on the inside, were impaled on the wires and the ends of the wires were bent over into the metal lath covering the outside of the insulation. After the insulating cement was trowelled into the metal lath and allowed to dry, wire netting was fitted over the surface and tightly laced. A weatherproof finish was provided by a ¼-in. thick (when dry) coat of asphaltic emulsion.

(Continued on page 106)

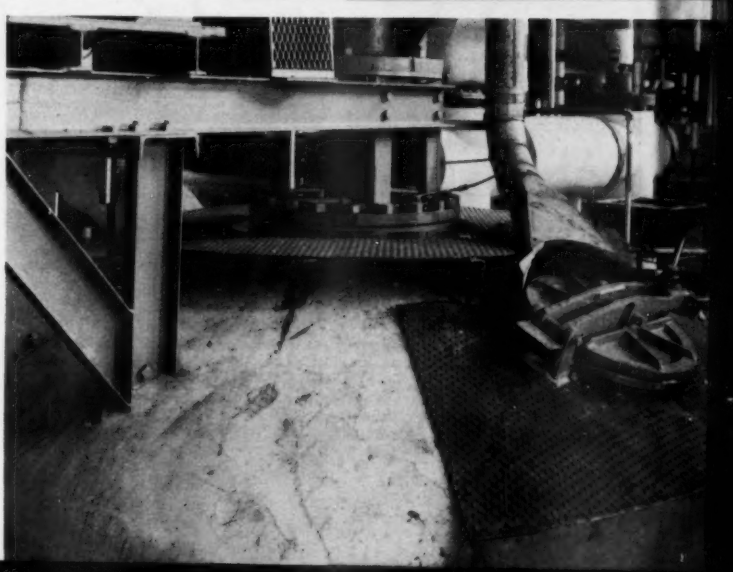


Fig. 4. Top: The motor at the left side of the exhaust duct is often worked on by maintenance men; that's why the excellent insulation job on the stack. Fig. 5. Center: A sheet metal jacket over this insulation was prescribed to keep the insulation itself from harm. Fig. 6. Below: This reaction kettle in a large chemical plant is insulated and the insulation is protected by metal plates on which maintenance men walk

Short Q and A on CMP

Industry must live with it, even if they don't like it . . . Here are some briefs on CMP to give the plant engineer a quick idea of what it's all about, where to get additional information, what forms are necessary . . . Sketch shows how application forms for allotments will flow from subcontractor to prime contractor, through the claimant agencies and the DPA, to the prime contractor to the controlled material producer

What is CMP?

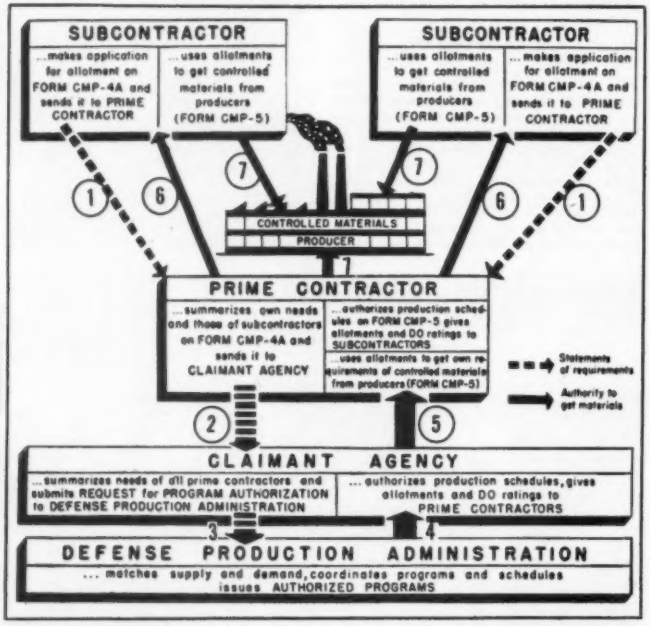
Controlled Materials Plan is a program devised to allot certain percentages of the country's production of aluminum, copper and steel to manufacturers of both defense and civilian products.

How Do I Get an Allotment?

You may not get one; it all depends on the products you now make or will be making. As in World War II, products programmed under the CMP fall into two categories: "A" products and "B" products. "A" products, generally, are those which are of special design made for a specific use, usually in the defense effort. The wheel of a freight car is an example. The wheel itself is an "A" product but the bolts, nuts and bearings which also go into the car, and which may be used also in civilian products, are classed as "B" products.

How Do I Know Whether or Not I Make a "B" product?

It will be necessary to obtain a copy of "Official CMP Class B Product List." This contains a list of more than 4,000 manufactured items containing steel, copper or aluminum. However, manufacturers of certain items on the list (those marked with an asterisk) will not be granted controlled materials allotments at the present time and they are instructed NOT to apply, except for materials for parts to be used for repair purposes.


SUBCONTRACTOR
...makes application for allotment on FORM CMP-4A and sends it to PRIME CONTRACTOR
...uses allotments to get controlled materials from producers (FORM CMP-5)
SUBCONTRACTOR
...uses allotments to get controlled materials from producers (FORM CMP-5)
...makes application for allotment on FORM CMP-4A and sends it to PRIME CONTRACTOR
1
6
7
7
6
1
CONTROLLED MATERIALS PRODUCER
PRIME CONTRACTOR
...summarizes own needs and those of subcontractors on FORM CMP-4A and sends it to CLAIMANT AGENCY
...authorizes production schedules on FORM CMP-5 gives allotments and DO ratings to SUBCONTRACTORS
...uses allotments to get own requirements of controlled materials from producers (FORM CMP-5)
Statements of requirements
Authority to get materials
2
5
CLAIMANT AGENCY
...summarizes needs of all prime contractors and submits REQUEST for PROGRAM AUTHORIZATION to DEFENSE PRODUCTION ADMINISTRATION
...authorizes production schedules, gives allotments and DO ratings to PRIME CONTRACTORS
3
4
DEFENSE PRODUCTION ADMINISTRATION
... matches supply and demand, coordinates programs and schedules issues AUTHORIZED PROGRAMS

By following the flow of figures and arrows it is easy to trace the movement of allotment applications from the prime contractor through channels and back to the prime contractor for "A" Products . . . For "B" Products the forms by-pass the claimant agency and go direct to DPA for determination of allotments

How Do I File?

If you make a Class "A" product you file if a claimant agency (any Government agency designated as such by Defense Production Administration, for example the Defense Transport Administration) asks you to or, if one of your customers who files as a maker of Class "A" or "B" products asks you to file. In either case, you fill in Form CMP-4A and send it either to the Claimant Agency or to the customer, whichever one asked you to file. Otherwise you DO NOT file.

If you make a Class "B" product (see above) you file if the product you make is NOT preceded by an asterisk in the Reference Manual. The products are listed in the Manual under Industry Divisions of the NPA. You fill in Form CMP-4B and send it to the division handling your allotment.

How About Construction?

Form CMP-4C is to be used for filing for an allotment for plant construction. Even if the building is to be used in the direct defense job, however, there is no guarantee that the material will be allotted. CMP Regulation 6 covers construction. Provisions are now being made to handle steel for essential construction, for the third quarter only, as "A" products.

How About Maintenance and Repair?

Allotments for maintenance, repair and operating supplies will be made as in World War II—you write your own allotments. Use the letters "MRO" followed by the designation of the quarter of the year in which the supplies are to be used. For instance the supplies to be used in the last quarter of this year would be identified as: MRO—4Q51. CMP Regulation 5 governs use of allotments to order MRO supplies.

Where Do I Get Copies of the Forms and Regulations?

All the forms, manuals and other material which will help you operate under CMP are listed in the box on page 81.

CMP Forms, Bulletins, Information and Where to Get Them

All of the following, with the exception of the final item, may be obtained from your local field office of the U.S. Department of Commerce. If you are located in a large city you can find this listed in the 'phone book. If not, ask your local Chamber of Commerce, trade association, or local newspaper. If there is no office nearby, write to National Production Authority, Washington 25, D.C.

CMP Regulation 1 defines rights and obligation under the Plan.

CMP Regulation 2 deals with inventory controls.

CMP Regulation 3 defines the preference status or priority system for delivery of controlled materials.

CMP Regulation 4 deals with delivery by distributors of controlled materials.

CMP Regulation 5 covers maintenance, repair and operating supplies.

CMP Regulation 6 deals with construction.

CMP Regulation 7 covers allotment of controlled materials to repair shops or to individual repairmen.

Product Assignment Directory and Official CMP Class B Product List. This tells whether or not the product you manufacture is considered to be a Class B item and tells which ones (marked with an asterisk) WILL NOT be granted controlled materials under CMP and thus will not have to file applications, and which ones MAY be granted controlled materials and WILL be required to file applications.

CMP forms and directions for filling them out:

CMP-4A is a form for application for allotment to makers of "A" products.

CMP-4B is a similar form for allotment to makers of "B" products.

CMP-4C is a form for materials allotment for construction.

CMP-5 to be used for passing on allotments from one manufacturer to another or to a distributor. This one is made up by you. A sample is shown in the copy of CMP Regulation 1.

ABC's of CMP is an outline of the principles and procedures of CMP.

What promises to be a most helpful publication in the coming era of orders piled on regulations and directions and amendments is the "Defense Production Record," a weekly bulletin covering defense production programs. Purpose of the Record is to provide a ready reference to the official actions of various agencies in convenient form. All concerned may obtain copies from the Superintendent of Documents, Government Printing Office, at an annual subscription rate of $2.50 domestic, and $4.00 foreign. Single copies will cost 5c each.

How Much of the Total Supply of These Metals Will Be Programmed Under CMP?

No reliable estimate has been made yet. Durable goods for consumers have previously used somewhere around 20 per cent of the total amount. There also is the whole area of MRO. During World War II, MRO was worked through a program of "set-aside." Manufacturers were directed to make the kind of items needed for MRO and these products were made available through warehouses, dealers and distributors.

Will CMP Affect Other Materials?

At the present time CMP will not affect other materials such as for instance, rubber. The plan is to continue using separate allocation systems for these other scarce materials.

How About Inventories Under CMP?

NPA Regulation 1 (See PLANT ENGINEERING, page 46, January, 1951) still governs inventories. See also CMP Regulation 2. If, however, inventories are *less* than a "practical minimum working" amount, you must observe the following rules:

Copper and aluminum—limited to a 60 day supply.

Steel—limited to a 45 day supply. This supply is based on current operation and schedules. Both CMP and non-CMP operations may be used to calculate the amount of controlled materials necessary for the 45 days. Structural steel for use in construction must be segregated and must not be ordered for delivery more than 45 days before it is to be used.

Can You Give An Example of CMP In Operation?

One of the best examples was outlined in "ABC's of CMP" see above listing. It was as follows:

1. The Department of Defense needs a large quantity of a certain type tank, and negotiates a contract for its production with Company X.

2. Company X, the prime contractor (or "prime consumer" under CMP definition) determines a production schedule and requirements for controlled materials. Company X then gets the controlled materials requirements from its suppliers of "A" products. ("B" product suppliers do not figure in this CMP compilation.)

3. Company X totals up the combined requirements for the contract —both as to quantities and delivery schedules—and presents the whole picture to the procuring claimant agency.

4. The Department of Defense (the claimant agency in this case) —adds the requirements for this tank contract to its other programs and presents a total claim for controlled materials to the Program Bureau.

5. The Program Bureau of DPA examines this claim, along with those of the other claimant agencies, weighs the combined total against the supply of controlled materials for the period ahead, and then authorizes a program and allots controlled materials to each Claimant. (If combined claims exceed supply or cut too deeply into the civilian reservoir, claims may be cut back.)

6. The Department of Defense, now having a total allotment of controlled materials, breaks this allotment down among its many programs according to its determination of relative importance.

7. For the tank contract in question, the Department of Defense then gives Company X an authorized production schedule, an allotment of controlled materials and an allotment number, and also issues a DO rating for the procurement of "B" components and other materials.

8. Then Company X (the prime consumer) passes along the allotment and the DO rating to its suppliers of "A" components so they can obtain needed controlled materials and "B" products to meet production schedules. If Company X also happens to manufacture a "B" component of the tank in its own plant, it makes separate application for an allotment of controlled materials to the appropriate NPA Industry Division.

While these operating steps under CMP place an extra burden above the normal flow of customer-supplier negotiations, the resulting advantages clearly outweigh the inconvenience. Government can be sure that total production planned for any period is in line with the supply of materials, and can guarantee that the materials will be available. And industry can be sure that all components of a complicated product will be produced.

Industrial Plant Piping Applications

When designing or modifying a plant the author says it is well to consider all possibilities . . . Design peculiarities of each type . . . What is the proper location? . . . General formula to follow in determining this . . . Loop or circulating systems? . . . Types of pipe coverings . . . Fire protection systems, types and their operation . . . Drain lines for water, sewage and industrial waste . . . Exhaust systems and their proper design . . . Pneumatic tubes and conveyors

By R. M. FRANCIS, Plant Engineer

BIG SUBJECT, isn't it? Sure, if you want to start from scratch, and go through all the steps of selection, design, detailing and so on. However, suppose we discuss some general aspects of the subject of piping in industrial plants.

First, a listing of the various kinds of piping to be considered. Some one, or all, of the following are included: steam, condensate return, air, water (hot and cold), gases, oil, sewage, refrigerant, acid and alkali, process liquids, vacuum, air-borne solids, hydraulic pressure.

Some of these are common to all plants, but a few pertain only to certain industries. For instance, acid and alkali lines are bread-and-butter items in chemical industries, but are unheard of in the average plant. And so it goes. Regardless, it is well to consider all the types of piping, at one time, when designing or modifying a plant. Just the space-requirements and location-requirements are sufficient reason for the above statement. Supporting racks, and trenches, will necessarily have to be designed for the ultimate number and types of piping, to be most economical over a long period of time.

Pipe Location

Each type of piping has its own design peculiarities such as expansion in steam lines, or streamlining in pneumatic conveyor piping. Also, each type is a complete study in itself. There are, however, some features of design common to all. It is some of these general characteristics which we will mention here, because many volumes have already been written on the details of piping design.

Take the matter of location, for instance. Where is the best place to put your pipes? Is it on the ceiling, along the walls, on the columns, in floor trenches, buried, inside the building or outside, supported on stanchions, or just a hit-and-miss scheme that seems most convenient at the moment? By all means, don't use the hit-and-miss scheme. The answer as to which type to use can only be determined by a careful study of the needs in the plant under consideration. Assume for a moment that piping designs are being made for a large, one story building, in which the column-spacing is wide, and in which few internal walls exist. Then what? Do the pipes go on ceilings, columns, walls, stanchions, or in the floor? This decision can really be a puzzler.

Floor Layout the Key

Basically, the answer to this question will come from the floor layouts. Obviously, if all "piped" equipment were to be installed along a wall, the answer would be apparent at once. Since such layouts are rare, one is faced with more complex problems. Also, if the roof trusses are high, the cost of drop lines to the equipment becomes a major item. Location of overhead equipment—(such as cranes)—must be given priority, since it cannot be moved to accommodate piping.

A good general formula to follow, in determining pipe locations, is this: 1. Study floor layout, to determine pattern of equipment locations with relation to walls, columns, etc; 2. Determine ceiling height, and feasibility of supporting pipes from same; 3. Weigh the value of appearance; consider the ease and cost of maintaining pipes in various locations; 4. Plan for complete flexibility and for future rearrangements; 5. Study advisability of using floor trenches—from a cost standpoint, and from a materials-handling angle. (The trenches present a possible hazard for trucks.); 6. Consider the grading of condensate returns; 7. Run a few cost-studies of the various possibilities, for use as a general guide; 8. Finally, select the best apparent scheme; then proceed to tear it apart for flaws. A good means of double-checking your decision is to draw a perspective sketch of a typical section of the piping arrangement selected. (Many a scheme looks good in plan view only; a three-dimensional sketch will help to eliminate errors in judgment.)

After the location has been determined, the major hurdle has been overcome, and your course is pretty clearly charted. The configuration of the various pipes to be mounted has to be determined, the pipes have to be sized, their materials selected. (The sizing is, of course, a science in itself, so we'll leave that to the authors of the textbooks and handbooks dealing with the subject.) The mounting arrangement is determined by a number of factors: the method of taking off taps, the appearance, the grading, the total weight, overall dimensions. All of this is relatively academic; some other considerations do, however, require personal selection.

Mainly, these consist of the following: (a) Number and location of taps for future use, (b) Installation of valves for shut-offs and for sectionalizing, (c) Selection of expansion fittings, (d) Cleanouts, (e) Streamlining, (f) Type of insulation and application, (g) Style of hangers, (h) Identification.

Loop Systems

Much has been said on the subject of loop-systems in piping. No general rule-of-thumb applies in this field, as the factors to be considered vary with the type of piping. Of course, some piping could not be looped; for instance, dust-collector lines. The commodity being conveyed in the pipeline plays a most important part in deciding whether a loop system is indicated. Also, the importance of maintaining low pressure-drop, and continuity of service, are deciding factors. And again, the value of flexibility for the future becomes much higher with a loop system.

Naturally, the cost of any loop system is at least double that of a one-line layout, but cost can become secondary in certain operations. In the installation of drinking-water piping, or paint lines, a loop is practically a must; in the first case, potability of the water requires it, while in the latter case it's a matter of maintaining a uniform mix in the paint. But when you get into the borderline cases, it's largely a matter

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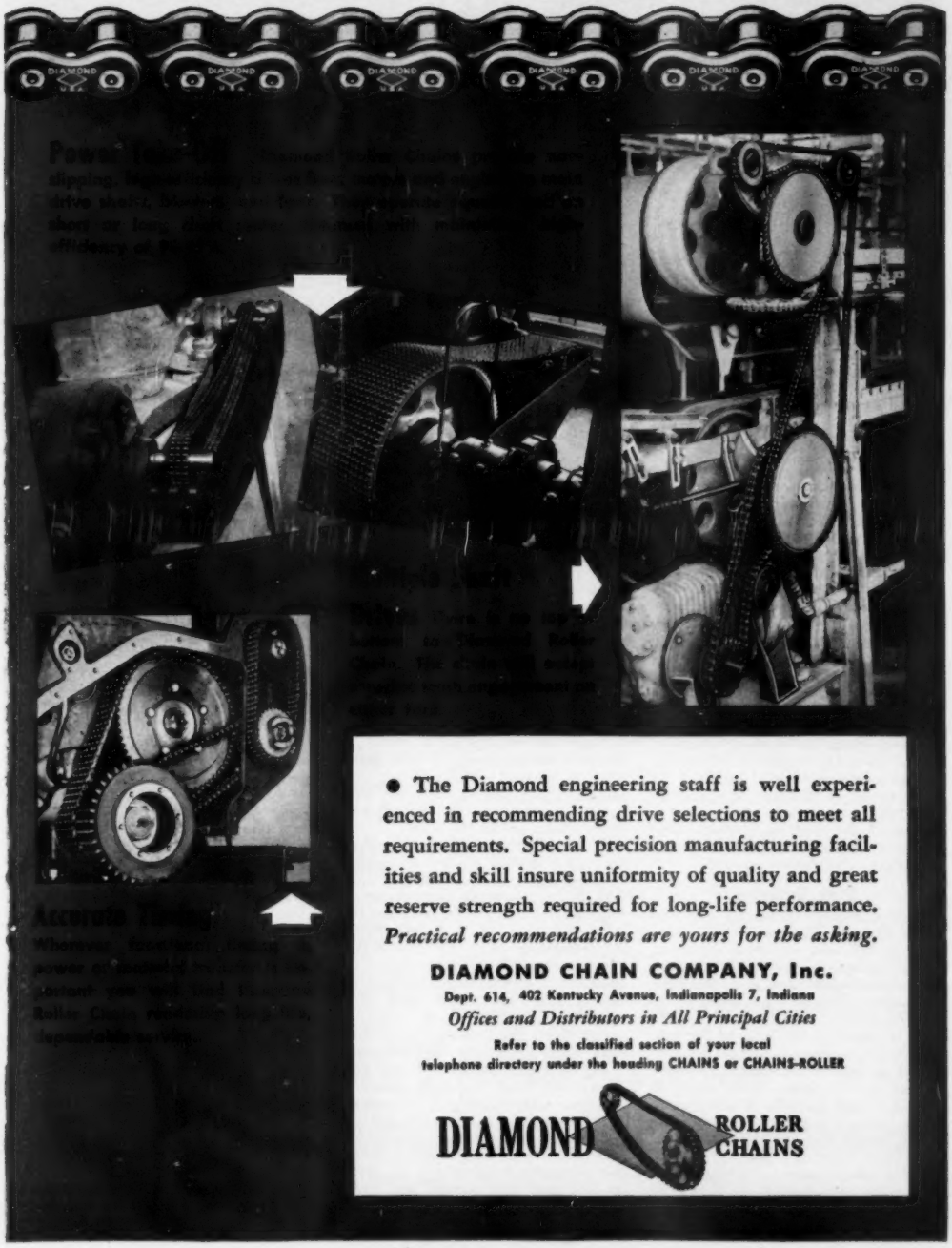

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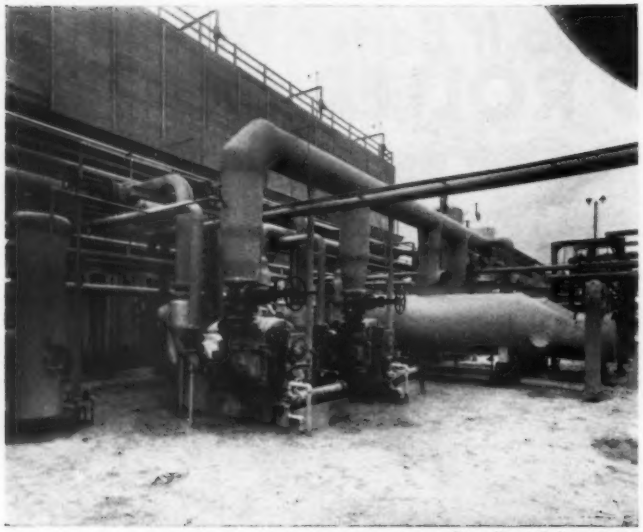


Photo: Elwood M. Payne, Houston

A good example of complicated piping which requires careful design and layout is illustrated by this photo taken at La Gloria Corp., Falfurria, Texas, showing two gas compressors which are handling iso-butane on refrigeration service

of economics. A value must be placed on all the factors mentioned above, and then a decision can be made based on cost versus advantages gained.

There is a slight difference between a loop, and a circulating system. In the first case, the commodity being conveyed does not have to be circulating. As explained, numerous factors dictate a loop system, whereas the primary reason for installing a circulating pipe layout is to deliver a constantly fresh supply of the commodity to any given point or points. The efficient piping of hot or cold water services is based on circulation. Obviously, if either liquid remains static in a pipeline for any period, it changes temperature sufficiently to cause waste in delivery of the desired product. The piping of paint is another example of strictly circulatory system.

Pipe Covering

Pipe coverings generally fall into three classes: thermal (hot), thermal (cold), and corrosion resistant.

The materials used most commonly for heat insulation are magnesia, glass-foam blocks, and asbestos in one of several forms. Cold insulation is provided by cork or fur felt. Still another insulation must be provided to pipe lines which are subjected to corrosion from acids or fumes, on the outside. Underground pipes, buried in certain types of fill, must be treated before burial.

Asphalt coatings are in general use for this purpose. Although there are many commercial products on the market, most of them use asphalt as a base. On piping in areas exposed to acid and alkali fumes, some form of corrosion-proofing must be applied. There are numerous products available for this use; most can be brushed or sprayed on the pipes. And they are available in several colors.

Modern piping specifications usually include some type of identification. Some companies have had their own standards for a long time and in recent years, the ASME set up a list of standards for general use in piping design. The application of pipe identification can be done in various ways: 1. Painting directly on the pipes, 2. Metal or plastic bands, and 3. Adhesive printed bands. When pipes are buried under floors, their accurate location, and type, can be indicated by markers set in the floor.

There are several companies which specialize in fire protection system engineering and installation. It is well for every plant engineer to be familiar with the rule-book on this subject, however. This information is obtainable through the N.B.F. Underwriters in a few condensed pamphlets. Probably as much damage is done by excess water from sprinkler systems as is done by actual fires. So, it is very important that shut-off valves be accessible, easily located, and quickly operable. There are four types of sprinkler systems: water pressure, "dry-pipe," non-freeze, and carbon dioxide.

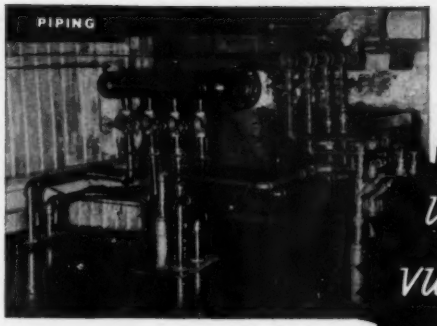
The first is most common, and is generally used in buildings where the temperature does not go down to freezing. The second and third types are used for heatless buildings. A dry-pipe system is one in which the piping is filled with compressed air, with water connected into the system at some point where the temperature is above freezing. The non-freeze sprinkler system employs an anti-freeze solution in the piping which is exposed in cold areas.

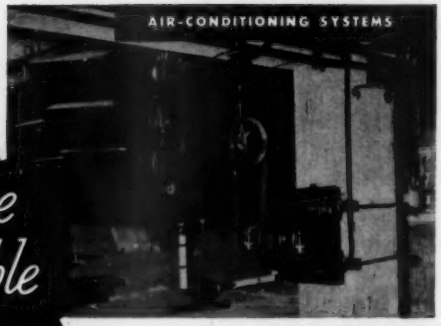
Of course, this anti-freeze solution must be non-inflammable! But don't laugh at that statement. The writer once had an experience along this line that might have been disastrous, save for a leak in a pipe fitting. In inspecting a new addition to a plant in one of the southern states, it was found that no sprinklers had been installed; further there was no heat in the building. Instructions were given to install an anti-freeze system before any materials were stored in the building. Weeks later, and only because of a leak in the piping, it was discovered that someone had followed the instructions perfectly but had used alcohol as the anti-freeze solution. Sounds ridiculous? It actually happened! The recommended solution for this purpose is carbon tetrachloride. Sprinklers are valuable at one time only, when you have a fire. They aren't of any benefit whatever before, or after, a fire. Therefore, it is quite necessary to make absolutely certain that the system will work automatically when needed and that the water can be shut off quickly after the fire has been extinguished or in case of accidental discharge.

The selection of dry-pipe vs anti-freeze systems is one of economics. If only a few short runs of sprinkler piping are exposed to freezing, they should be filled with anti-freeze solution. If, however, the system is extensive and requires a considerable volume of liquid to fill it, a dry-pipe setup is indicated. The sprinkler heads must be installed according to formula, too. For instance, if a head is directly in front of a unit-heater, it naturally requires a higher fusing temperature than one in a normal location. Water supply behind a sprinkler system is of vital importance, as a sustained fire can easily consume a large volume of water in a short time. All of these factors can be determined through consultation with engineers from your insurance company.

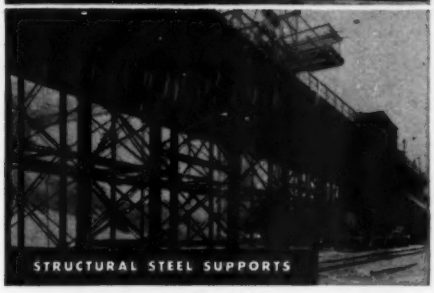
Carbon Dioxide Systems

Carbon dioxide systems are used for the control of fires in two categories: flammable liquids, and materials which would be damaged by water, or which water would not properly penetrate. When released into an area aflame, carbon dioxide displaces the free oxygen supporting combustion, thus extinguishing the fire. The CO_2 is stored, under high or low pressure, in tanks or manifolded cylinders. From such a storage center the gas is piped to the





in these vulnerable places



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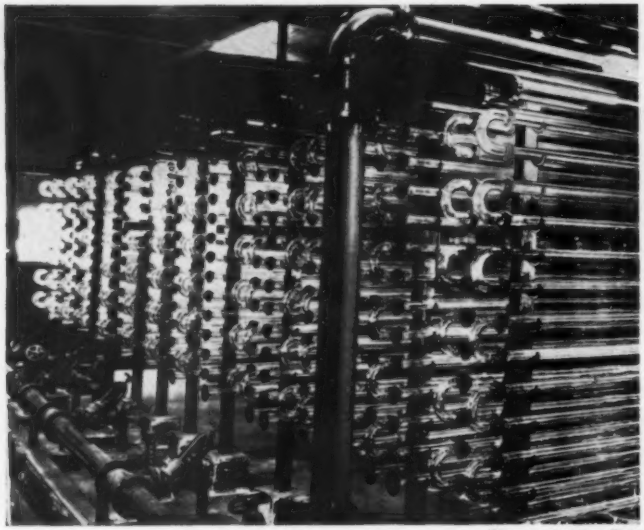

Photo: Corning Glass Works

Another example of special piping problems is this heat exchanger installed at the Basic Magnesium Institute, Las Vegas, Nevada. Twenty-seven miles of glass pipe and many hundreds of return bends were used in its construction

critical area and released when a fire occurs.

Spontaneous combustion fires, in stored materials such as coal or sawdust, can be most efficiently controlled by the use of CO_2. The gas can be forced to the heart of the fire, and will not damage the material. Also, valuable clothing, fur coats, etc., can be protected best with this system.

Naturally, if it is a high-pressure system, the first cost of an installation is higher than ordinary sprinklers, but their respective applications are entirely different. In a confined area, protection from suffocation must be provided for employees; this is done by locating exits within easy reach of the workstations so that employees may get out of the confined area quickly. Carbon dioxide is quick, positive, and non-damaging to materials.

Drain Lines

Drain lines for water, sewage, and neutral industrial wastes, fall in the cut and dried category, insofar as this article is concerned. The sizing, and selection of material for same, are items easily obtainable from texts and handbooks. However, in the matter of acid-proof drains, much is to be learned, and to be desired. For a number of years, there have been several good materials available for this purpose; they are of two types, metallic, and non-metallic. The principal disadvantages of these has been cost and brittleness. In recent months, a couple of new ones have hit the market. These are all plastic, or plastic-lined steel, pipe and fittings.

Chemical tests have proven that at least one of each type is quite satisfactory, and that costs can be reduced by their use. Temperature is usually the limiting factor in determining the best material to use, even more so than the liquid to be handled. If the waste liquid is very hot, it can be tempered with cold water, automatically. This will permit the use of plastic materials which have only the disadvantages of temperature limitation. The piping made of plastic materials has another great advantage: it is almost 100 per cent salvageable when relocations are to be made. This cannot be said of the older, more brittle materials, as you will readily agree if you have ever had to relocate such a drain system. And the plastic materials can be secured in either flexible or rigid tubing.

Hopping from one end of the list to the other, we must not overlook the big piping, dust-collection systems, for instance. A complete system for this purpose includes suction fans, graduated ducts, collectors, separators or cyclones, transfer fans, hoods, "floor-sweepers," shut-offs, gravity-valves, flexible taps, and filters. The collectors are either of the wet or dry type. The wet type is generally used where the dust being collected is low in volume and abrasive, or otherwise incompatible from an air-contamination standpoint.

The sawdust collection system is one of the best-known types. In all woodworking operations, a large volume of offal must be collected and carried away from the machines. High velocities and large volumes of air are required to do this job efficiently. Again, we will steer clear of design features; this is a pretty exact science, and plenty of data is available on the subject. There is one note of warning that should be sounded at this point. Do not install any type of exhaust without providing sufficient air replacement. This mistake has been made many times in plants, often with disastrous results. First, the exhaust system cannot operate most efficiently unless air-replacement equals that being exhausted. Next, unless sufficient replacement air, of the proper quality, is supplied the exhaust system will pull air from all possible outside sources. And this means that dirt is pulled out of the area. Some extra dirt may not be serious, but heat costs money.

It's quite simple. An exhaust system handling 50,000 cfm will attempt to get the 50,000 from the area if it can't, the air will come from the outside. In summer, this is okay but in winter it can be disastrous. Then, one of two things must happen. The exhaust system will take most of the heat out of the building, or it will quit working efficiently. So, when planning to install any sizable exhaust system, include the cost of sufficient air replacement equipment and install the two at the same time. Since the facilities for the make-up air must provide enough heated air to supply the exhaust system, you must keep the quantity of air down to a minimum for satisfactory operation. There are several good schemes for returning a large portion of some types of exhausted air to the inside of the buildings. It all depends on the contaminant in the air. Wet-type collectors are one good example of air-return. This equipment washes the suspended solids from the air and deposits them as sludge, while the cleaned air is returned to the room.

Pneumatic tubes should not be overlooked in the study of plant piping. Certainly they are not applicable in every plant, but this equipment pays off in some types of operations. If the type of manufacturing demands the movement of small parts in small quantities—from one point to another a tube is well worth considering. Of, if a continual flow of paperwork such as shop orders must go from office to factory or vice versa, a tube system is still a good bet. At least, put pneumatic tubes on your check-list of industrial piping. Of course, it's special equipment, but it's for sale if you need it.

Hotels have long used central-plant vacuum-cleaning systems, but very few industries find them applicable to their cleaning problems. That doesn't mean that they are not practical in industry. A central vacuum system has many advantages; its only disadvantage is first

(Continued on page 109)

Industry looks to Powell

Fig. 19084 W. E.—Class 900-pound Cast Steel Pressure Seal Globe Non-Return Valve with welding ends and gear operation. Improved streamline design reduces pressure drop and turbulence to the minimum.

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What's Happening in the Field?

High Vacuum Impregnation Saves Motors

THE RAPIDLY growing use of Diesel locomotives is familiarizing many railway service shops with the use of high vacuum impregnating equipment. High vacuum impregnation of motor and generator armatures, originally conceived as valuable for improvement of dielectric properties, is shown by experience to be even more valuable for its contribution to mechanical stability.

The shop procedure now recommended for prevention of heat and centrifugal force hazards is high vacuum impregnation of the armatures of both generators and traction motors (and sometimes stators) with a varnish impregnant. The parts to be treated are oven-dried to remove the greater part of the moisture. They are then placed in a Stokes vacuum dryer-impregnator for removal of all air and the last traces of moisture from the crevices and pores of the complex windings. Varnish from an adjacent storage tank is then introduced into the evacuated impregnating chamber under pressure from tanks of nitrogen or carbon dioxide. Pressure is maintained for a time sufficient to allow the impregnant to penetrate all pores and interstices of the parts. After excess impregnant has been drawn back into the liquor storage tank the parts are oven-dried for several hours.

The result is a hard, inflexible structure, almost monolithic in character, and so protected internally that swelling or relative movement of the insulation and insulated elements is impossible.

"Air" Packaging for Delicate Products

A REVOLUTIONARY principle of packaging which would permit an egg to be dropped from an airplane may soon be marketed commercially.

The new method, evolved by Harold Cohen, instructor in product design at the Institute of Design of Illinois Institute of Technology, operates on a pneumatic principle using confined air as a cushion.

Delicate instruments, chemicals, and explosive material can be packaged for transport without danger of shock or atmospheric damage with a saving of material, space, and expense, Mr. Cohen explained.

Basically, the object is held between two elastic diaphragms by controlled and variable air pressure within two interlocking shells of metal, plastic or paper. The diaphragms are each sealed to the outer shell.

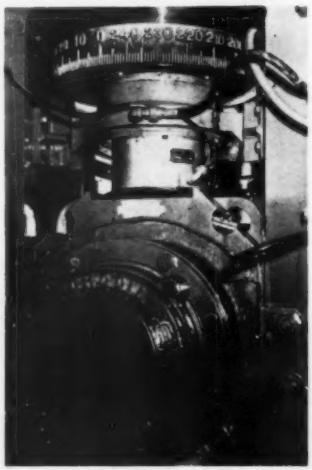
Air pressure within the shells is controlled by valves, and can be varied with size, weight, and density of the material or object being packaged. Over-all size of the shell need be no more than twenty per cent larger than the object.

There is no limit to the size or weight of the object. Pressure may be varied to permit any suitable or desired degree of "play," or the object can be held absolutely rigid.

Plastic and metal shells may be stamped or cast and are re-usable. Cheaper models of treated paper are disposable. By using clear plastic, delicate instruments need not be removed from the casing, and can be read accurately without danger of damage from handling.

Load Measuring Units Help Make Uniform Sheet Aluminum

TO OBTAIN MORE uniform aluminum sheet products, cold strip rolling mills at the Edgewater plant of Aluminum Company of America have been equipped with Baldwin-



Lima-Hamilton load measuring units incorporating bonded resistance wire strain gages.

With these load weighing devices at each end of the mill rolls, closer control is possible because they provide an accurate, continual indication of roll loads, and load may be adjusted while rolling. This feature permits control of sheet gage as the sheet is being produced, without waiting until a whole length has gone through the rolls. Protection against bearing overloads is also provided.

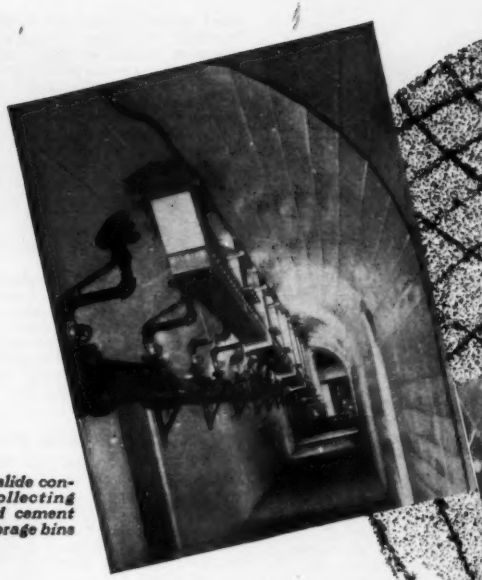
The mill reduces aluminum strip from 11 gage (⅛ in.) to 24 gage (0.025 in.). Load capacity of the two cells on this rolling mill is 600,000 lb each. An important feature of this force measuring device in rolling mill service is that it has practically no deformation under wide variations of load.

The load measuring unit is essentially a short steel column on which SR-4 strain gages are bonded. Compression of the column changes the electrical resistance of the fine wire grid of the strain gages, four of which are employed and wired together in the form of a Wheatstone bridge. The load may be measured by any of several types of instruments, including indicators and recorders that may be calibrated directly in pounds or other units.

Accuracy of measurement is high and permanent. An over-all accuracy of 1 per cent of scale is guaranteed under normal mill conditions. Load cells are compensated for temperature variations so that they give good reproducible accuracy over a range of plus or minus 50 deg. F. from normal operating temperature.

Insulating While Hot Prevents Expansion Troubles

ENGINEERS AT THE Disco Corporation, Imperial, Pa., have solved the problem of expansion cracks in thermal insulation by insulating the high-temperature metal surfaces of their carbonizers and roasters at operating temperatures—up to 1050 F. Thermal expansion from shutdown to processing temperatures adds about 8-in. to the length of each carbonizer and 5-in. to the length of each roaster; insulation installed on the huge units while shut down would be very liable to crack and lose some of its effectiveness. By applying mineral wool blankets and cement to the metal surfaces while hot, at maximum expansion, the insulation covering was fitted at normal operating conditions.



F-H Airslide conveyor collecting Portland cement from storage bins

Screw conveyor replaced by F-H Airslide

AIRSLIDE means "AIR-BORNE"

For sheer simplicity, low-maintenance costs and ease of operation, the F-H Airslide conveyor is just about tops! In this system, dry pulverized materials like cement, lime, gypsum, soda ash, flour or similar products are aerated or fluidized and made to flow like water. Air is dispersed through the material from a porous medium so that each particle is enveloped in air, thus reducing the inter-particle friction and the angle of repose. Hence the material flows.

Think what this means to you? Because the system is completely enclosed, danger of contamination is removed. Dusting is eliminated. The only power required is low-pressure air in small quantities. There are no repairs, replacements or costly down-time. Easily erected and definitely a space-saver, the F-H Airslide conveyor permits a flexibility of plant design not available with straight-line conveyors.

Why not let our engineers show you how the F-H Airslide can help cut your conveying costs . . . modernize your present plant equipment or plan an entirely new system. Chances are we can show you how a minimum expenditure can bring you a conveyor system that means low cost, reliable operation.

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DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS — FEEDERS AND ASSOCIATED EQUIPMENT

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NEW PRODUCTS summarized for your convenience

LIQUID LEVEL CONTROL

Utilizes torsion tube assembly for transmitting level changes

The Climax Type 888 Displacement Liquid Level Controller is designed for external mounting on kettles, receivers, separators and similar equipment where it is desired that the level controller can be isolated without shutting down the main systems when repair or adjustments are necessary. It is suggested for all types of liquid level control applications involving exacting and wide range control. Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.

MAGNETIC STARTERS

Are smaller and lighter in weight, for use in hazardous locations

The new line of Explo-Safe and Weatherproof Magnetic Starters features compact and rugged Feraloy housing in combination with company's RA (right angle) type of mechanism. Motor controls are available in sizes 0 through 4 for a wide range of applications. According to manufacturer these are the smallest starters on the market, and extremely light in weight. Other features announced include straight-through wiring and ease of installation. Terminals are accessible from the front, as are the contacts. Line and load may be separated; circuits immediately identified. The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.

ELECTRIC TACHOMETER

For motor applications requiring continuous speed indication

Now available with manufacturer's Varidrive Motors is the Model R-1 Tachometer and Generator in ratings from ¼ to 50 hp and speeds from 2 to 10,000 rpm. The sturdy, permanently lubricated ball bearing type generator is coupled to the Varidrive and requires no other source of power. The tachometer indicator is enclosed and can be mounted at distances to 300 ft from Varidrive. The standard indicator dial shows operating speed as a percent of the Varidrive maximum speed, and by the use of a percentage indicator the rate of production of a given machine is instantly available. Other forms of dial indication may be ordered. Supplied with each unit is 10 ft of two-conductor cable, so tachometer can be mounted in best location. U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Cal.

LIQUID WAX

Is self-polishing, slip-resistant, for use on all types of floors

Tremwax greatly exceeds accepted safety specifications for floor wax, according to manufacturer, and is listed as anti-slip material by Underwriters' Laboratories, Inc. It dries quickly to a hard, smooth non-sticky film that repels dust accumulation. Reasons given for its slip-resistance are (1) the harder film doesn't have the tendency to shift and slide under traffic, and (2) this harder film is less likely to be picked up on the soles of shoes. Tremwax is also said to be highly resistant to moisture and its hard finish minimizes marking and scuffing. The Tremco Mfg. Co., 8701 Kinsman Rd., Cleveland, O.

HIGH SPEED CHAIN DRIVE

Is developed to offer ruggedness of gear drive, smoothness of belt

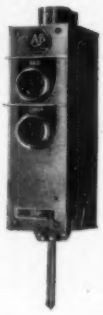
The new Hy-Vo (high velocity) Chain Drive makes possible single drive units capable of transmitting up to 5000 hp at linear speed to 6500 fpm, or rotative speeds to 3600 rpm, according to company engineers. They point out that this drive permits the use of smaller, less expensive power plants, an increase in speed with narrower widths, and the elimination of many accessories usually required for high speed engines. The Hy-Vo is claimed to increase efficiency and reduce costs wherever single motors or engines are used in sizes of 100 hp and up. It is also suggested for heavier self-propelled mechanical equipment, large fans, ventilating equipment.

Its improved performance is credited to a new chain-and-sprocket engagement principle intended to eliminate "chordal" or polygon action, a form of vibration which shortens chain life. The Hy-Vo sprockets are made with curved involute teeth, and the chain incorporates a compensating rocking joint. During articulation the joint shifts the pitch line automatically, engaging the sprocket teeth so the chain follows a path tangent to the sprocket pitch line, to effect smooth, almost vibrationless action. "Stretch" is said to be reduced to the point where take-up is almost unnecessary, of importance for applications where center adjustment is impractical.

Company engineers emphasize that the Hy-Vo supplements, rather than replaces, roller or silent chain drives. It is intended for high speed applications and to replace unwieldy belt drives formerly required in many applications of high-speed power transmission. Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

PENDANT CONTROL STATION

For use as a portable control or suspension above a machine



The Bulletin 800T Pendant Push Button Station is available in sizes having three units including the stop, to 10 units including stop. Standard stop unit is a wobble stick in the bottom of the enclosure, but can be furnished as a mushroom head mounted in bottom or in front of the enclosure. Enclosures are equipped with oil-tight control units. Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee, Wis.

TWO-STAGE PUMPS

In sizes from 2 to 10-in. discharge, heads to 750 ft

The Type DMD Pumps are a redesigned line, improved with regard to compactness, efficiency and mechanical ruggedness. The two-stage design of these high-head pumps is described as most effective in that a single pump driven by a single motor, produces as much head as two single stage pumps piped in series. The new models are suggested for high head water works, building water supply, hydraulic elevators, oil refineries, chemical plants, boiler feeding.

Among features stressed by manufacturer of these economical, rugged pumps is the horizontally split casing with interconnecting passage between the two opposed impellers. Available in capacities to 4500 gpm. Economy Pumps, Inc., Hamilton-Thomas Corp., Hamilton, O.

ELECTRIC FORK TRUCK

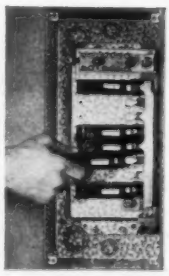
Offers increased speed, has "fingertip" directional control lever

The new Clipper is an electric battery-powered fork-lift truck of 2000-lb capacity at 24 in. load center. Standard equipment includes automatic acceleration, "deadman" safety control, pivot mounted steering axle and cushion-style tires, as well as the "fingertip"

(Continued on page 114)

LOAD CENTERS

Provide for future expansion in circuits, changes in capacities



These new load centers and service equipment, known as the add-on type, are assemblies of company's Thermag or Quicklag Circuit Breakers. They are said to combine dependable thermal-magnetic automatic circuit protection with the convenience and flexibility of add-on type circuit breakers.

Designed for small installations, the units come in five sizes of enclosures—8, 12 and 16 circuits, single row and 12 to 20 circuits, double row. Basic units have four single-pole, or two double-pole. Units have screwless assembly and only one pressure-type connection between breaker and bus bar. Breakers are interchangeable. Dept. EE, Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo.

The "BOOKLET-OF-THE-MONTH" for every industry that uses petroleum products

Here is a practical cooperative plan that can help you cut controllable costs and offset higher non-controllables. From this single source you can get effective assistance on any problem that involves a petroleum product—any type of petroleum product.

Gulf Periodic Consultation Service makes available to you the regular counsel of one or more trained engineers, backed up by technologists who are skilled in every phase of petroleum science and who have years of experience with practically every type of industrial process and equipment.

This knowledge and experience can be applied profitably to your operating and maintenance problems. In your continuing efforts to increase manufacturing efficiency and profits, here is an important and definite step you can take—at once. Send for your free copy of the booklet which explains this cost-cutting service.

FIFTY YEARS OF SERVICE
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PETROLEUM AND ITS PRODUCTS

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Please send me, without obligation, a copy of the booklet "Gulf Periodic Consultation Service."

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Company.....
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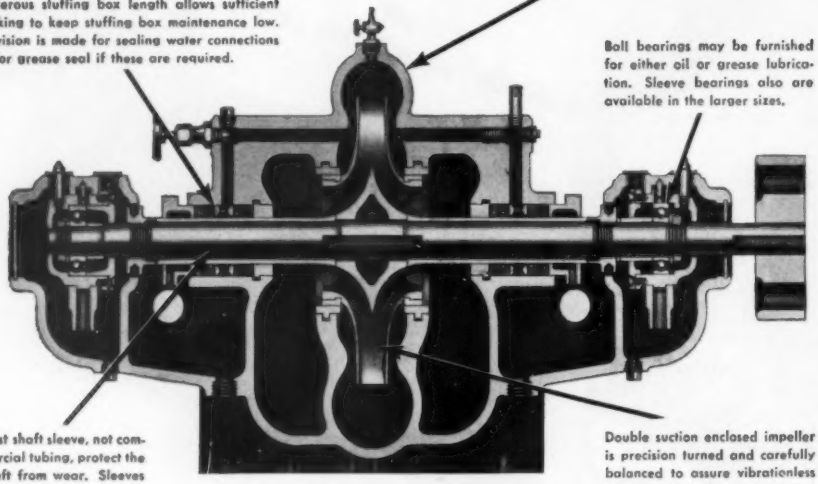
Address.....

ALLIS-CHALMERS Double Suction PUMPS

Standard and special materials available for many types of service. Iron, bronze, stainless steel and combinations of these materials handle both acid and alkaline solutions.

Heavy, horizontally-split cast-iron casing construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.

Generous stuffing box length allows sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.



Ball bearings may be furnished for either oil or grease lubrication. Sleeve bearings also are available in the larger sizes.

Cast shaft sleeve, not commercial tubing, protect the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.

Standard sizes range from 10 to 7000 gpm with heads as high as 475 feet. Larger sizes are available.

Double suction enclosed impeller is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.

Built for LOW MAINTENANCE

GENEROUS CONSTRUCTION is a term you'll often hear describing Allis-Chalmers double suction pumps. That is because these pumps are built with the extra metal thicknesses, extra strong parts, extra construction features and extra careful workmanship that means lower pumping costs for you.

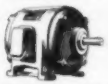
Every Allis-Chalmers double suction pump is carefully tested on the most modern pump testing equipment in the industry. Each installation is individually engineered by men with experience in thousands of pump installations to give you exactly the right pump for your needs.

Allis-Chalmers can take full responsibility for your pumping operation because Allis-Chalmers can furnish the complete installation—pump, motor, drive and control—all built of coordinated design by one manufacturer. Efficient operation is assured and installation problems are reduced.

Whatever your pumping problem, call the nearest Allis-Chalmers Authorized Dealer or Sales Office or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 08B6146. A-3266

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

ANNOUNCING...

THE NEW

OTC POWER-TWIN

HYDRAULIC PULLER

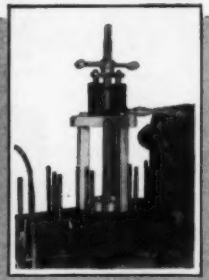
WITH THE CENTER HOLE

***Greatest advancement in* Push-Pulling *since* OTC Grip-o-matic**

- **Fits all OTC pulling units**
- **Works in any position**
- **Pushes—Pulls**
- **Faster than screw operation**
- **Eliminates torque**
- **More powerful—friction eliminated**
- **Easier—just light pump strokes**
- **Safer—remote control**

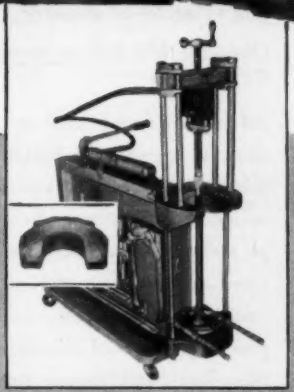
The fastest, easiest working, handiest PUSH-PULLER in history . . . sensational in performance, its time and labor saving ability and low cost make it a must for any shop. See your jobber for complete information or write us.

CENTER HOLE permits Power-Twin to do jobs no other hydraulic ram can do . . . makes possible application of direct force . . . fast, easy, unlimited adjustment . . . versatile interchange of parts.



Pulling and installing wet or dry cylinder sleeves is simple with OTC Power-Twin and Sleeve Puller.

OTC Power-Twin with 1003-L Grip-O-Matic and 952 attachment pulls side carrier bearing easily.



New OTC Hydra-Tote takes all tools to the job. Portable hydraulic pulling unit includes OPEN THROAT pressplate.

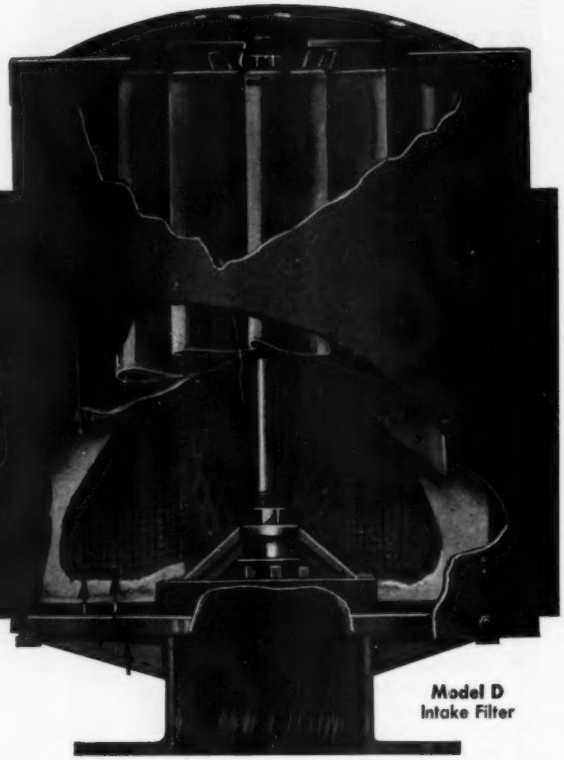
(Inset) Press Plate available separately for mounting on bench or service truck.

OTC OWATONNA TOOL COMPANY

446 CEDAR STREET • OWATONNA, MINNESOTA

NOTE:
To Men Responsible
for Engine and
Compressor Operation

THE EFFICIENCY OF STAYNEW INTAKE FILTERS INCREASES WITH USE



Model D
Intake Filter

This fact can mean the difference between *full* and *seriously reduced* output . . . between *frequent repairs* due to intake of abrasive, clogging dust and *no repairs*.

All Staynew Intake Filters are Dry-type — no moving parts, no reservoirs, no liquids. Air velocity is not critical, temperature extremes have no effect. As dust accumulates on the medium, filtering efficiency increases — *yet tests prove that resistance may reach less than 2.75" water after thousands of hours of operation.* Radial Fin design of insert and all-wool felt medium provide unsurpassed protection . . . virtually 100%. More than 600,000 Staynew Intake Filters have been placed in service. *A fine engine or compressor deserves a fine filter.* Specify Staynews for more HP or CFM at lowest possible cost.

Model KE
Economy Filter

Model C
Small Capacity Filter

Model DS
Silencer-Filter

A 12"x12" Staynew Radial Fin Insert Has 2059.2 Sq. In. Active Filtering Area—the same proportion as this panel bears to Insert below

This filtering area in Insert this size.....

Model IDR
Ground Level Servicing, High Level Intake Filter

Bulletin SIF On Request

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION 55 CENTRE PK., ROCHESTER 3, N.Y.

FILTERS FOR: ENGINES • COMPRESSORS • PIPE LINES (AIR, GAS, LIQUID) • VENTILATION

the adaptability of this BJ BILTON is more important now than ever!

The production problems to be met in the years ahead may demand a pump that can do more than one job ...a pump that can meet changing conditions of use...a pump that can be kept in service with a minimum of downtime. That's why now—more than ever—the adaptability of this Byron Jackson Bilton Pump has special importance to you. For more data on the Bilton or a BJ Job-Engineered Analysis of the model for your specific need, contact your local Byron Jackson sales office or write

Byron Jackson Co.

Since 1872

Dept. 65, P.O. Box 2017, Terminal Annex, Los Angeles 54, Calif.

OFFICES IN PRINCIPAL CITIES

BJ BACKS YOU UP with Nation-wide service and a dependable parts source

SAVES SPACE

...close-coupled motor and pump are constructed in a single unit on a common shaft. No need for rigid foundation or base.

SIMPLIFIES INSTALLATION

...mounts in any position, at any angle, including wall mounting or sling mounting for portable use.

FEATURES INTERCHANGEABLE PARTS

...simplified construction uses fewer parts and allows easy interchangeability of all basic parts.

MINIMUM SPARE INVENTORY

...a small number of spare parts can serve a large number of working Biltons, providing full repair protection with a minimum inventory.

VERSATILE IN APPLICATION

...single-stage models meet all classes of low to medium head service. Two-stage models fill medium and medium-high head service.

AVAILABLE IN SPECIAL CONSTRUCTION

...BJ Mechanical Seal for handling liquids with special temperature, corrosion or pressure factors. Also explosion-proof motor, or other special construction.

LOW HORSEPOWER CONSUMPTION

...close-coupled construction allows more efficient application of power to pump.

WIDE CAPACITY RANGE

...Single-stage models in 1¼, 1½, 2, 2½, 3, 4 and 5 inch sizes. Two-stage in 1½" size. Capacities to 2000 gpm, heads to 475 ft.

triple-threat to trouble!

A PROBE TYPE VACUUM TUBE VOLTMETER

As an a-c probe type vacuum tube voltmeter, ranges of 3 to 300 volts, frequency coverage extends from 50 cycles to 300 megacycles. Specially designed RF and D-C probes supplied.

AN ELECTRONIC VOLT-OHMMETER

Using 115 volts, 60 cycle external power, Model 769 is a stable electronic instrument providing 6 ranges from 3 to 1200 volts d-c full scale and 6 ohmmeter ranges to 2000 megohms full scale.

A VOLT-OHM-MILLIAMMETER

With self-contained power source, provides 6 d-c voltage ranges (10,000 ohms per volt)—6 a-c rectifier type voltage ranges (1,000 ohms per volt)—6 d-c current ranges and 3 ohmmeter ranges.

WESTON model 769

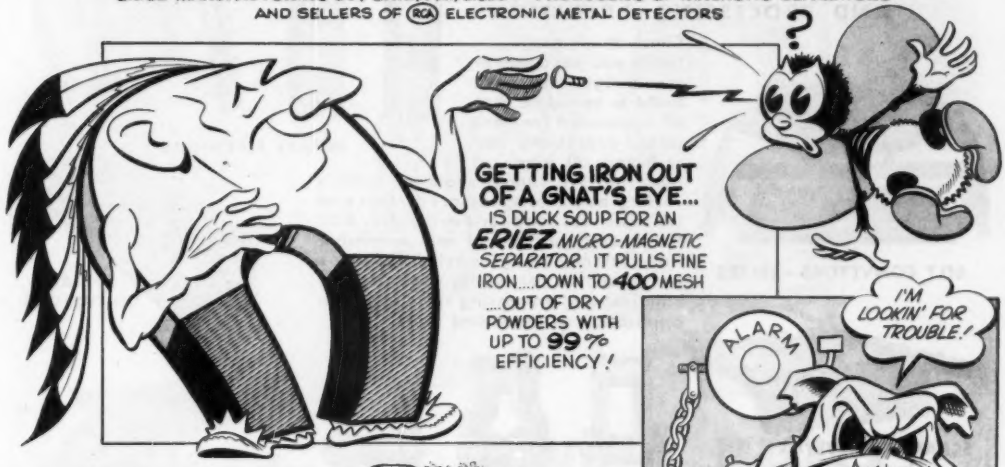
ULTRA HIGH FREQUENCY ELECTRONIC ANALYZER

Here is a truly versatile, three-in-one instrument that's a natural for those engaged in electronics production or maintenance. The entire instrument is protected from external RF influences. Its broad range and its complete stability make it ideally suited for AM, FM, and television testing, as well as for many applications in the HF and VHF fields. Uses standard commercial tubes, replaceable without recalibration. Extremely compact, Model 769 provides greater economy, greater convenience, because this one instrument provides for practically all electronic measurements. Literature available . . . WESTON Electrical Instrument Corporation, 624 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

ERIEZ MAGNETIC ATTRACTIONS

ERIEZ MANUFACTURING CO., ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS

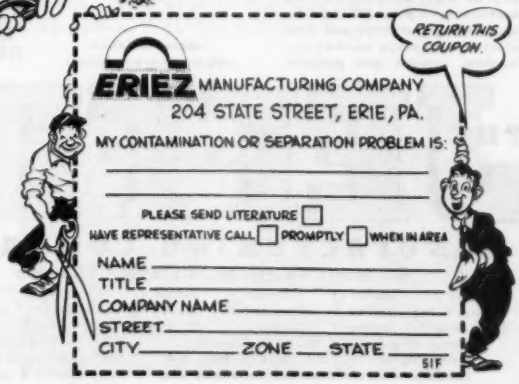


GETTING IRON OUT OF A GNAT'S EYE... IS DUCK SOUP FOR AN *ERIEZ MICRO-MAGNETIC SEPARATOR*. IT PULLS FINE IRON....DOWN TO **400** MESH ....OUT OF DRY POWDERS WITH UP TO **99%** EFFICIENCY!

THE ***R.C.A.*** METAL DETECTOR, SOLD BY ***ERIEZ***, IS AN **ELECTRONIC WATCHDOG** THAT SPOTS ANY KIND OF METAL IN ANY KIND OF NON-METALLIC MATERIAL OR PACKAGE. WARNS BY GONG OR LIGHT, OR REMOVES THE CONTAMINATED PACKAGE .... ***AUTOMATICALLY!***

RECOVERY OF EXPENSIVE TOOLS WITH AN ***ERIEZ*** **ATOM**AGNET PULLEY PAID FOR THE UNIT IN A YEAR. THE PULLEY AUTOMATICALLY CLEANS IRON AND STEEL FROM MATERIALS BEING CONVEYED ON BELTS.

AN ***ERIEZ*** PLATE-TYPE **ATOM**AGNET HAS MAGNETICALLY LIFTED A CIGARETTE WEIGHING **447** *TIMES* MORE THAN THE FERROUS PARTICLE HIDDEN IN IT! ....RESULTS ARE JUST AS STARTLING WITH OTHER PRODUCTS.



ERIEZ MANUFACTURING COMPANY
204 STATE STREET, ERIE, PA.

MY CONTAMINATION OR SEPARATION PROBLEM IS:

_____

_____

PLEASE SEND LITERATURE ☐

HAVE REPRESENTATIVE CALL ☐ PROMPTLY ☐ WHEN IN AREA

NAME _____

TITLE _____

COMPANY NAME _____

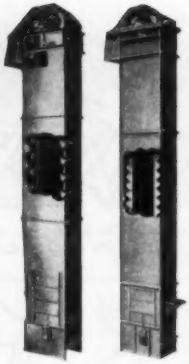
STREET _____

CITY _____ ZONE ___ STATE _____

SIF

Partial List of WHAT WE MAKE

TO HELP YOU IN YOUR HANDLING AND PROCESSING OPERATIONS



BUCKET ELEVATORS

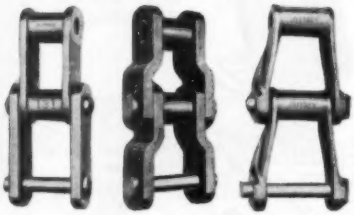
Check these items . . . likely you need one or more right now. We build a complete line of equipment for handling, processing and reducing all kinds of material. We cannot show everything Jeffrey builds to speed production and cut costs, but send for Booklet No. 832 for a quick picture of our extensive line. Jeffrey's engineering facilities are available for laying out complete handling and processing systems or the application of individual units.

BELT CONVEYORS—IDLERS

SPIRAL CONVEYORS

SCRAPER CONVEYORS

For handling bulk material horizontally or on incline, discharging at fixed point through valves in trough bottom. Also wood or steel Apron Conveyors.



CHAINS SPROCKETS ATTACHMENTS

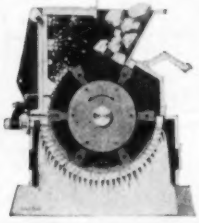
FEEDERS—CONVEYORS

A wide range of sizes and types in electric vibrating feeders, conveyors, screens, packers, etc. Absolute control over tonnage handled.

M-V MECHANICAL VIBRATING CONVEYORS

For conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit. Also electric vibrating conveyors, feeders, screens and packers.

More detailed information on request.



CRUSHERS—SHREDDERS GRINDERS—PULVERIZERS

BARREL PACKERS

For economy in packing operations—reduce size of container, increase its capacity and cut shipping costs. Also conveyor-type packers and packing tables.

THE JEFFREY MANUFACTURING COMPANY

Established 1877

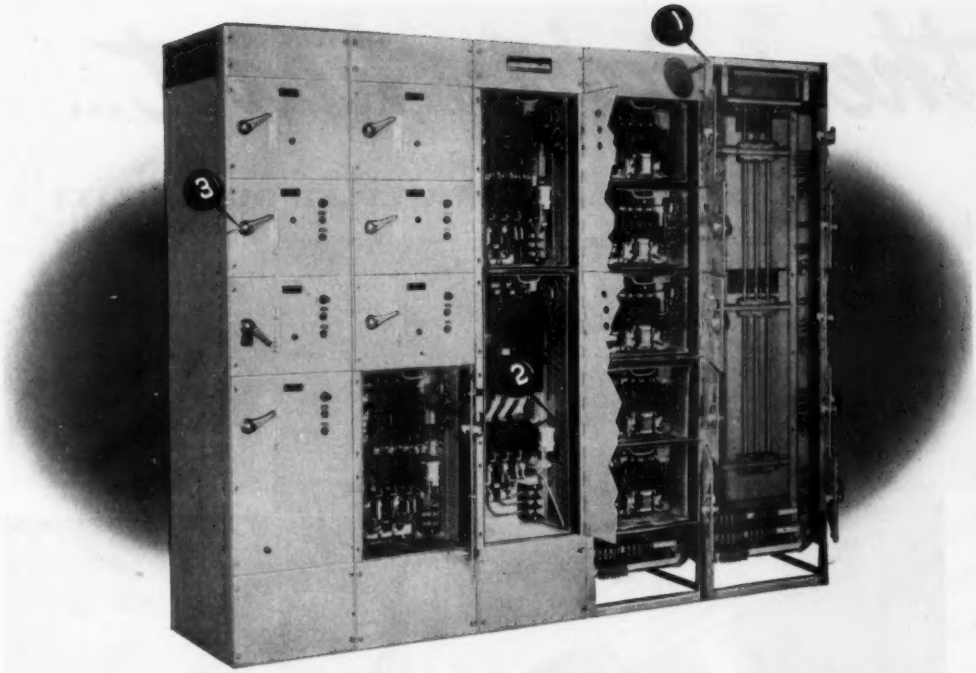
905 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

JM

Baltimore 2	Boston 16	Cincinnati 2	Detroit 13	Jacksonville 2	Philadelphia 3	Salt Lake City 1
Beckley, W. Va.	Buffalo 2	Cleveland 15	Harlan, Ky.	Milwaukee 2	Pittsburgh 22	Scranton 3
Birmingham 3	Chicago 1	Denver 2	Houston 2	New York 7	St. Louis 1	

Jeffrey Mfg. Co. Ltd., Montreal, Canada
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.
The Ohio Malleable Iron Co., Columbus, Ohio
British Jeffrey-Diamond Ltd., Wakefield, England
The Galion Iron Works & Mfg. Co., Galion, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio



Everybody says "WELL BUILT"

And they really mean it when referring to Westinghouse Control Centers. Here you get top-quality construction which gives you all the advantages of centralized motor control . . . quality at every one of the following points:

1. **Sturdy, Self-Supporting, Tight Structures.** No need for angle iron or other bracing. No gaps or cracks to permit entrance of foreign objects. Interior is fully protected.

2. **Complete Baffling** localizes unusual arcing if faults occur. A short circuit in one starter unit cannot spread throughout the entire structure. Removable grill baffle on right side of each unit provides easy accessibility.

3. **Safety Doors,** with safety-interlocking handles, remain on the panel when the starter unit is removed. Doors can be fastened closed over open space to prevent entrance by unauthorized personnel.

For further evidence of a "well-built" control center, check these features: self-cooling construction for foolproof ventilation, plug-in starter units, vertical and horizontal wiring troughs.

You get all these features and more, when you specify Westinghouse Control Centers. The complete story is contained in Booklet B-4213. For your copy, write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-27009

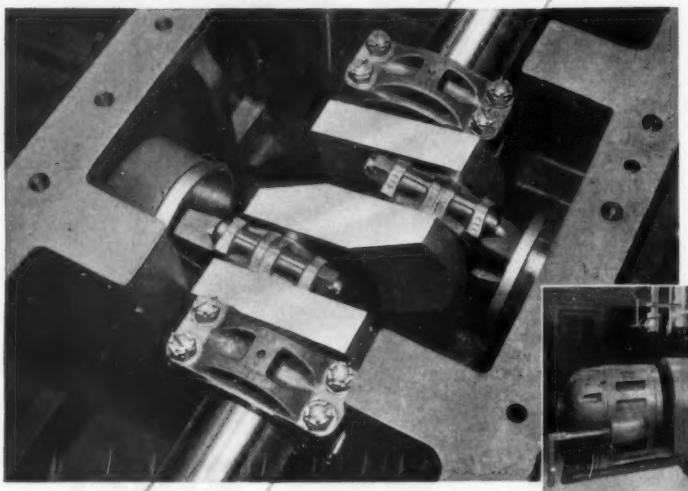
DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

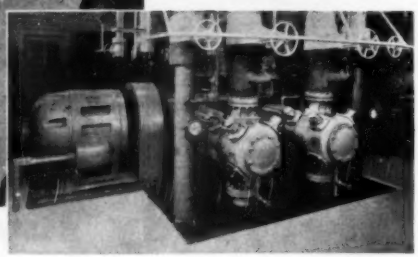
Westinghouse

CONTROL CENTERS

the mighty heart...

THAT IMPARTS UNRIVALED DURABILITY





Clark CMA-4, 300 bhp, 600rpm, balanced/opposed, motor driven compressor in chemical company dry ice plant.

Rugged, smooth-functioning and vibration-free, this is the mighty heart that imparts unrivaled durability to Clark Balanced/Opposed, Motor-Driven Compressors.

With a sturdy, generously proportioned, one-piece forged steel crankshaft, to assure a full lifetime of continuous service . . . with cylinders mounted on opposite sides of the crankcase and driven from adjacent 180° opposed crankthrows, to cancel out all unbalanced forces (without use of counter weights) . . . it's easily understood why the Clark CMA balanced/opposed design "belongs" wherever air or gas must be compressed. For, its smooth, vibration-free performance holds down foundation size, installation and maintenance costs, while its compactness reduces floorspace requirements.

Clark balanced/opposed compressors are available in a range of sizes from 150-4500 bhp. Full data and literature are available from your nearest Clark representative.

MIDGET ANGLE • RIGHT ANGLE • BIG ANGLE
ELECTRIC-DRIVEN • CENTRIFUGAL

SEE the difference in

CLARK

CLARK BROS. CO. INC.

One Of The Dresser Industries

OLEAN, N. Y.

New York • Tulsa • Houston • Chicago • Boston
Washington • Los Angeles • Birmingham • Detroit
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Balanced/Opposed COMPRESSORS

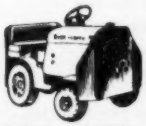
Save time... Cut Costs

Handle More Loads with BUDA FORK TRUCKS

The new Buda 2000 lb. Fork Lift Trucks are fast—powerful—tough. They're built for your kind of work. Compact design, easy maneuverability and short turning radius makes them ideal for loading and unloading material . . . for lifting, carrying and stacking in narrow aisles and on crowded loading docks.

Find out how these new Buda Fork Trucks can cut material handling costs and time for you. Ask any Buda Material Handling Distributor for all the facts today. Write for Bulletins and data. THE BUDA COMPANY, HARVEY, ILLINOIS.

The Line with all 3 for diversified handling



TOWING TRACTORS

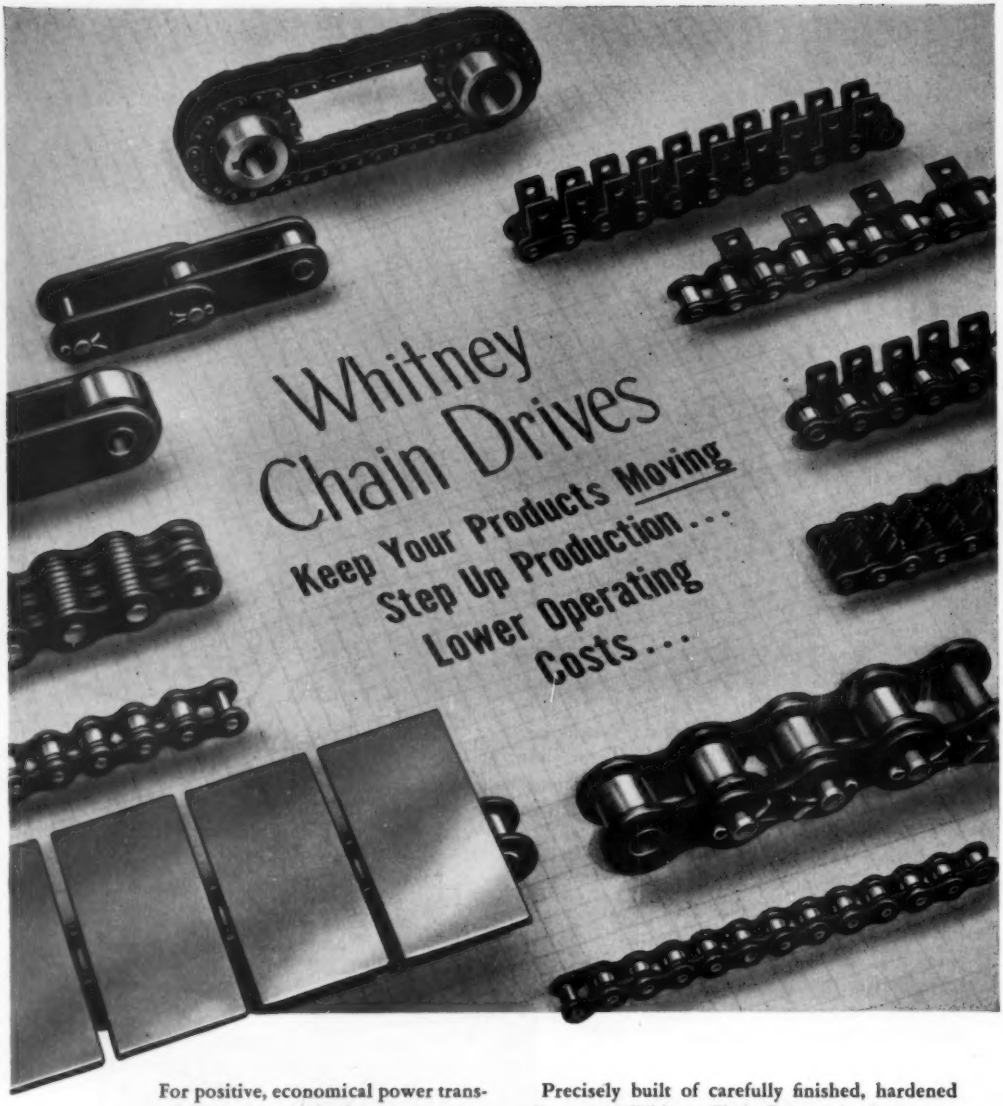
PLATFORM TRUCKS

FORK TRUCKS

BHA-22

BUDA

Manufacturers of Diesel and Gasoline Engines, Maintenance of Way Products, Lifting Jacks, Earth Drills and Material Handling Equipment



For positive, economical power transmission . . . smooth flowing conveying of bottles or packaged goods at high or low speeds . . . transferring bulk materials . . . split second timing motions where accuracy has top priority.

If these are your problems, Whitney Chain Drives will provide the solution with savings in time and money.

And not only do these adaptable chain drives fit perfectly into your design planning. What's more, they insure top machine performance by maintaining a constant, high level of uniform production.

Precisely built of carefully finished, hardened alloy steels, Whitney Chain Drives give long service life . . . keep maintenance at a minimum, assure maximum output and lower costs.

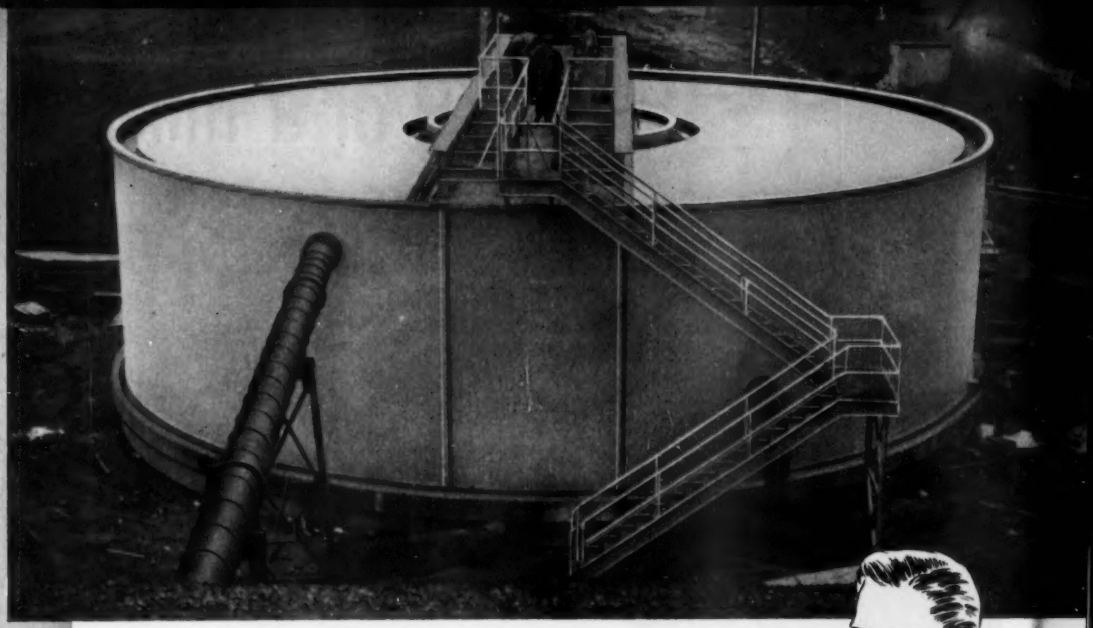
WHITNEY SERVICE

In addition to the service facilities of over 130 Distributors, Whitney maintains a network of 15 Field Engineering Offices located throughout the country. From the complete line of Roller, Silent and Conveyor Chains, Whitney Engineers can recommend, without bias, the proper type of drive for your application. Consult your nearest Whitney Field Office or write us direct for catalog and complete information.

WHITNEY CHAIN COMPANY

232 HAMILTON STREET, HARTFORD 2, CONN.

A *Good* waste-treatment system...



costs *far less* than you think!

HERE'S HOW ONE MAN LEARNED THIS FACT:

A paper manufacturer, faced with the problem of waste treatment in his plant, guessed that a good system would cost him a six-figure sum. To avoid paying so high a price, he sunk a considerable amount into a home-made system—which simply did not do the job. And so he called in consulting engineers.

After making a complete survey of the mill, analyzing samples of its waste, and thoroughly studying the problem, the engineers made their recommendations. They were accepted by the surprised manufacturer, and the system was built.

The waste-treatment plant cost *even less* than the supposedly-cheap makeshift equipment that had failed, and it provided an effluent completely acceptable for re-use in the mill.

It also produced some benefits the manufacturer never expected:

- **A large amount of raw stock was recovered**
- **Stream pollution was eliminated**
- **There was an important reduction in heat losses**

The manufacturer estimates the new system will have paid for itself within three years!

Maybe *you* have been putting off the question of water, sewage, or industrial waste treatment for your plant or community because you think the cost prohibitive. Don't guess; you will probably be wrong! *Call in consultants specializing in this field.*

FREE BOOKLET

FOUR WAYS TO ECONOMIZE ON INDUSTRIAL WASTES ...is a factual treatise offering much useful information on its subject. Write for your copy today! Address: Gilbert Associates, Inc., 412 Washington St., Reading, Pa.

GAI
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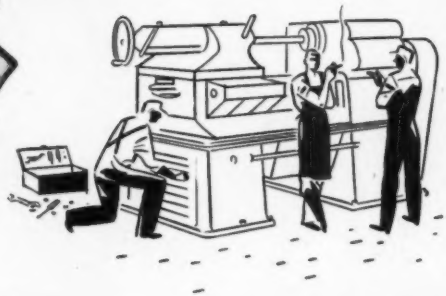
GILBERT ASSOCIATES, INC.

ENGINEERS • CONSULTANTS • CONSTRUCTORS

READING, PA.

NEW YORK • PHILADELPHIA • WASHINGTON • HOUSTON • ROME • MANILA • MEDELLIN

A #&$! of a time for this to happen!



(And time to look for a better way to *control* preventive maintenance)

Too bad the maintenance men didn't get to this machine a few days sooner, when it would have been easy to *prevent* the breakdown.

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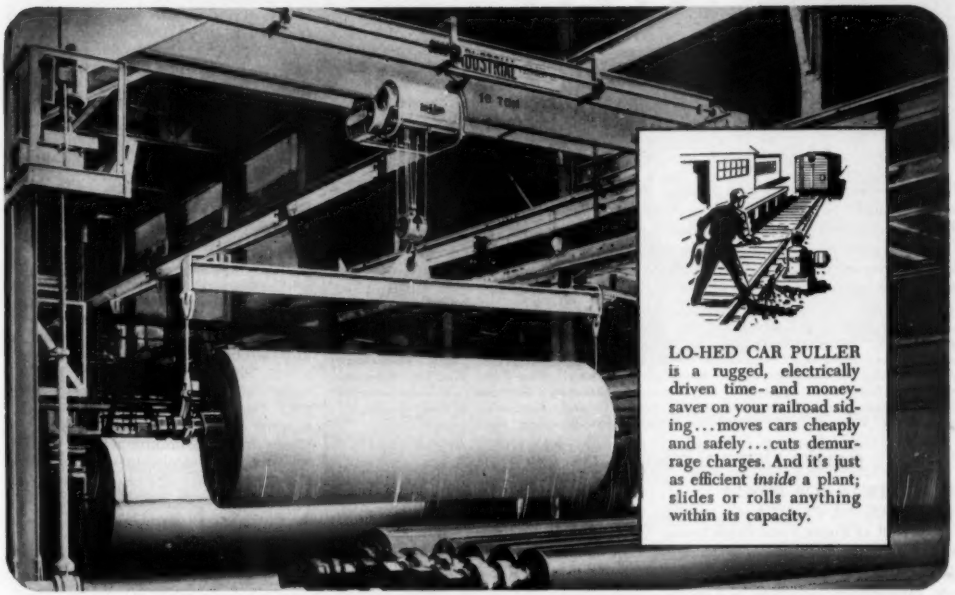

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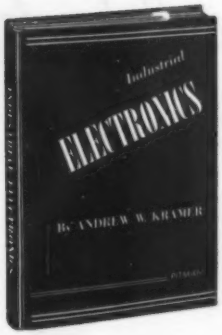

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Insulation

(Continued from page 79)

Protection of insulation itself is illustrated in Fig. 5 where parallel vertical downcomers feed water at about 450 F to the lower water wall on Boiler No. 4 at the Glenwood Power Plant. The area to the right of the piping is often used for maintenance and repair work and is a frequently used traffic lane. Glenwood's engineers, to insure continuously effective insulation without periodic repair, specified a 6-ft high sheet-metal jacket over the piping from the boiler floor up.

Each of the 4-in. vertical pipes is covered with 2½-in. thick molded-type pipe insulation. Additional insulation is provided by block sections which are shaped and inserted between the parallel lines. Mineral wool insulating cement seals the cracks and provides a smooth surface. Asphalt paper was stapled to the insulation and covered with 10-oz. canvas sewn on to provide a tight fit. The canvas was glue-sized and two coats of aluminum paint applied. The 26-ga protective jackets were cut, fitted around the piping and fastened with sheet-metal screws. The installation has been made more economical and better looking by applying the asphalt paper, canvas and sheet-metal covering over several parallel pipes as a unit.

Skid-proof metal plates are used to protect the insulation on the top of the reaction kettle in Fig. 6. The kettle, used in the manufacture of resins at a Pennsylvania chemical plant, operates at temperatures as high as 550 F and is insulated with 3-in. thick mineral wool blankets finished with insulating cement. Employees must have access to the center of the top surface and the hatch on the right and formerly braced their feet against the insulation to remove the hatch cover. Damaging of the insulation in this manner is prevented by the metal plates installed around the hatch and the center of the tank. Additional expense of the plates is small compared to the savings obtained through reduced maintenance of insulation.

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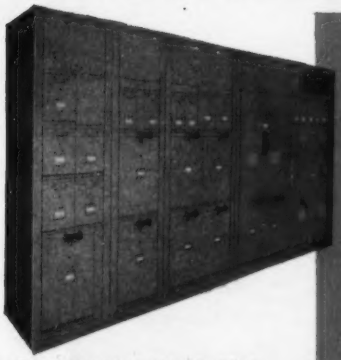

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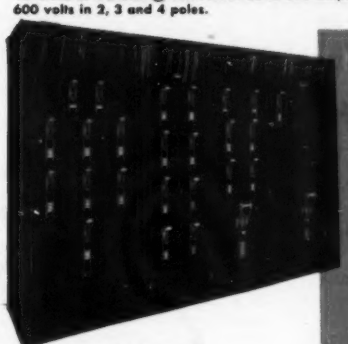

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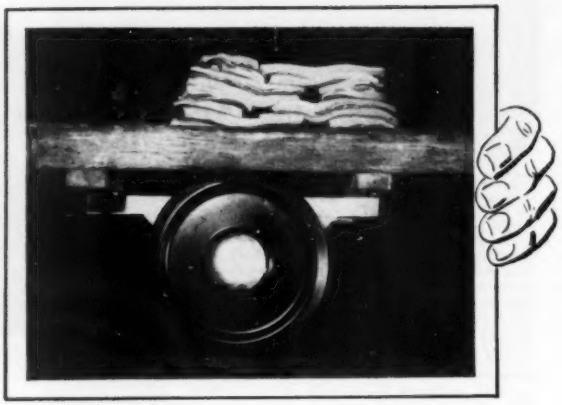

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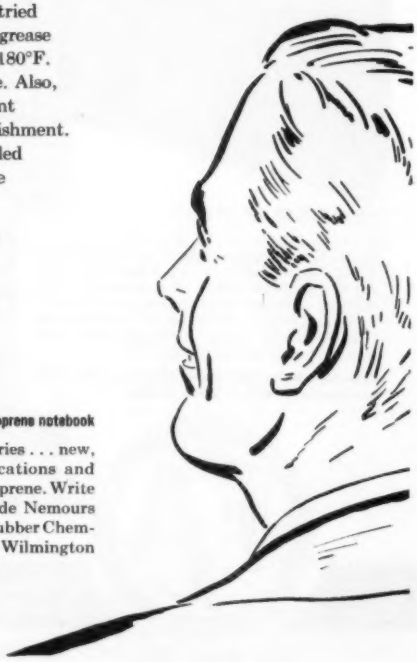

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Industrial Plant Piping Applications

(Continued from page 86)

cost. In office areas, the noise-level of cleaning is reduced, and the flexibility of the system lends speed and efficiency to the cleaning program. A central vacuum system is particularly effective in processes generating a lot of lint and dust.

Pneumatic conveyors are relatively simple, and provide economical, clean, and efficient movement of dry materials from point to point. Almost any dry material can be handled by this method. If the material is abrasive, the piping must be rubber-lined, or made of a material which will withstand the scouring action of the air-borne material. All fittings in pneumatic conveyor systems must be streamlined to minimize the resistance to flow. Any sharp curves are very susceptible to erosion from conveyed materials, so must be kept to a minimum.

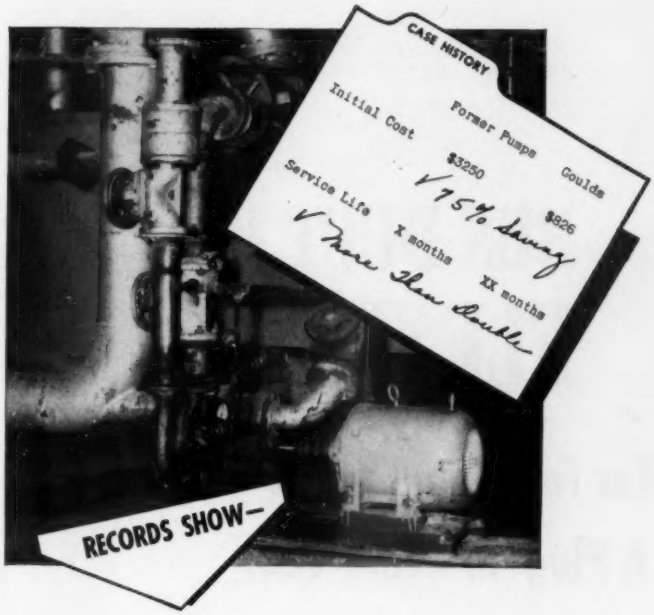
There are two methods of furnishing motive power to pneumatic conveyors; 1. pressure-type, and 2. suction-type. The first type either pulls the material through the fan, or blows it from an injector. The second one uses the suction fan at the delivery end of the line. In either system a collector is required at the delivery end, to separate the material from the air which carried it.

Sufficient volume and velocity of air must be furnished to keep the material in suspension and to move it. Generally speaking, light, bulky materials (like cotton) can be conveyed at low velocity while heavy, fine materials (like cement) require high velocities.

Certain formulas are available in handbooks for calculating all the variable factors in pneumatic conveyors. However, these formulas are mostly theoretical and must be balanced by a certain amount of experimentation. Manufacturers of this equipment have done the experimenting for you. They will design and install a system that will efficiently convey most any material, along most any course, for any distance.

Pneumatic conveyors provide low-cost handling, with low maintenance expense, elimination of dust, and protection of the material conveyed. They are much cheaper than mechanical conveyors and require less space. Their limitation is that only certain types and sizes of materials can be handled.

So much for the general classes of industrial piping. There are types, of course, that have not been discussed. However, it is felt that the average plant engineer will generally cover the field in his plant with those mentioned.



How a manufacturer cut costs tremendously with Goulds stainless steel pumps...

When handling corrosive liquids, pumps alone can be an important item in your processing budget. One alert plant engineer in the southwest cut his pump costs to about an eighth of what they had been.

The pumps he had been using for an especially erosive crystaline slurry cost $3250. When they wore out he replaced them with Goulds Stainless Steel Centrifugals for only $826. But this tremendous saving in initial cost was only half the pay-off. The Goulds pumps have already been in service *twice as long* as the ones they replaced . . . and they're still going strong.

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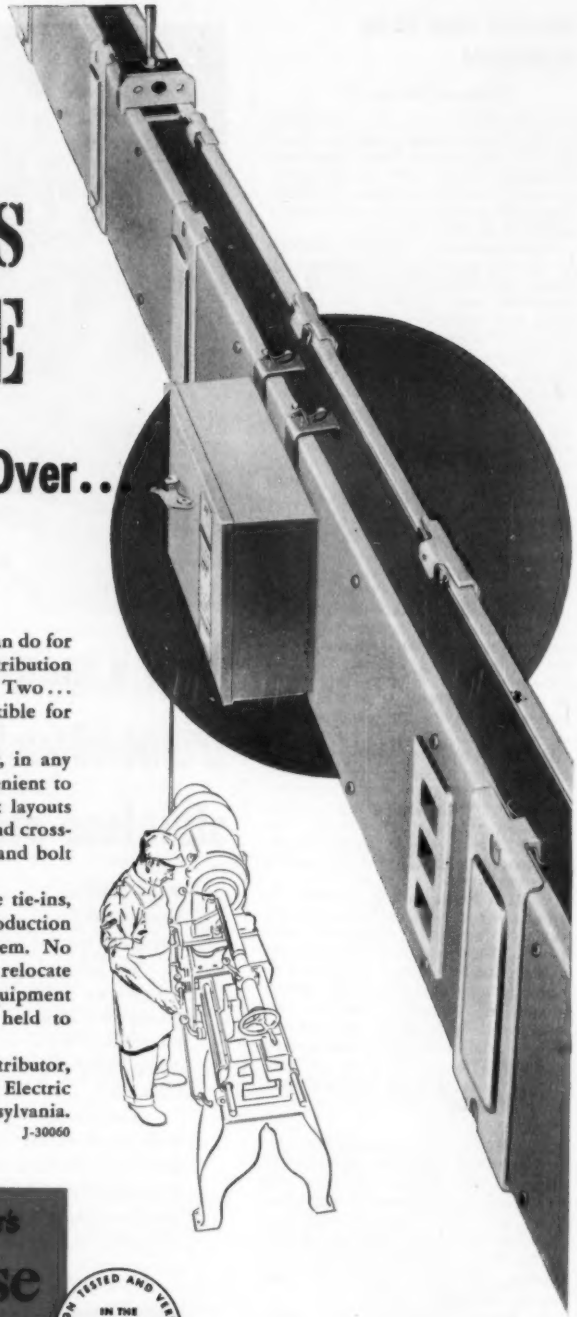

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(Continued from page 36)

139 **"Work Horse" Lift Truck**—Form 1135C, 8 pp, describes and pictures manufacturer's new Model "20," a 2000-lb lift truck designed to do more work per hour. Explains economy, flexibility of operation and safety factors of the new truck which features a heavy-duty Wisconsin engine, extended clutch life, pneumatic tires and low over-all height. Includes specifications, operating data, photos of truck in action. Hyster Co.

140 **All-Purpose Lifts**—"Let Big Joe Do It" is a bulletin on hydraulic lifting units. Features a heavy duty model for lifting loads to 52 in. height. Also describes and illustrates hydraulic hand truck for lifting and stacking barrels, boxes, crates. Gives prices. Big Joe Mfg. Co.

141 **Before You Buy a Loader**—Detailed in 6-pp Form AD-32 are 18 points to be considered when selecting a loader—questions covering capacity, performance, construction, safety, strength, attachments and cost. Company's Shoveloader is described in detail and pictured in use. Specifications given. Lull Mfg. Co.

142 **Portable Elevator**—Illustrated Form PS-28A presents a portable elevator with rigid triangular steel tower. It's designed for both maintenance and construction work and has lifting capacity of 1000 lb at 110 fpm. Specifications of elevator given; electric and gasoline power units for use with it are described, pictured. Wilson-Albrecht Co., Inc.

143 **Containers, Lightweight and Collapsible**—This illustrated folder introduces Alumatainers, pallet-type containers made of aluminum, engineered to carry full loads and fold flat for shipping. Gives capacity, weight and size information, also comparative cost figures on different containers. Hamlin Metal Products Co.

144 **Chain Conveyors**—Engineering and application data on an overhead chain conveyor system featuring increased flexibility and economy of installation and maintenance is presented in Form OOF-251, 16 pp. Major components of system are pictured, as are installations in food processing plants, metal working plants, clothing factories, forner arrangements are diagrammed. Instructions for erecting are included. Chain-O-Flex Corp.

145 **Meet Trucks on the Level**—This bulletin stresses streamlined freight handling possible with company's Adjust-A-Docks for installation in loading platforms. Special advantages of the hydraulically operated adjustable docks are described and illustrated. Rowe Methods, Inc.

146 **For the Big Pulling Jobs**—Gasoline, electric and steam hoists with line pull capacities to 30,000 lb, as well as car pullers, cranes and derricks are described and pictured in 12-pp Bulletin M-1B. Also describes builders' towers, elevators and a power roller. Clyde Iron Works, Inc.

147 **Magnet Chains**—Ox bow chains designed for handling materials with electromagnets are described in Form DH-237. Gives dimensions, discusses features which give chain added strength and increased wearability. American Chain Div., American Chain & Cable Co., Inc.

148 **Industrial Casters** — Ordering and application information covering light, medium and heavy-duty casters are given in this illustrated folder. Includes prices. Faultless Caster Corp.

CONSTRUCTION AND MAINTENANCE

150 **To Keep Plant Floors Dry**—Form A361 covers Floor Dry No. 85, a granular mineral compound described as highly effective in absorbing oil, grease and other liquids and providing a non-slip surface. Stresses increased safety, economy of the compound, ease of use. Includes comparison test data. The Eagle-Picher Sales Co.

151 **Open-Web Steel Joists**—Bulletin 3002B is filled with engineering data on open-web steel joists. Explains their 10 major advantages, and discusses their use in fire-resistive construction, in wood construction and as purlins. Properties, dimensions given, and load tables included for standard, special and purlin joists. Details and dimensions for various types of bridging, anchors, connections, extensions, clips and other accessories are included. Also provided are instructions for erection according to recommendations of Steel Joist Institute, data on long-span construction. Ceco Steel Products Corp.

152 **How Are Your Roofs?**—Six-pp Form 102-7 is intended to help to assist plant engineers determine the exact condition of their building roofs and plan necessary repairs. Illustrates virtually all types of roof damage; explains how and why roofs deteriorate and indicate trouble spots where first danger signs appears. Patching and leak-stopping methods are described in detail as are means of resurfacing and renewing old roofs. The Monroe Co., Inc.

153 **To Preserve Stainless**—"How to take Care of Your Stainless Steel Equipment" is a 24-pp pocket-size maintenance manual, of value not only in every day plant operations but also in helping to make stainless steel last longer and give better service during the defense period. Discusses types of stainless and various finishes, value of keeping stainless clean and how to keep it clean. Also touches upon discoloration on stainless steel surfaces, and includes ten important "don'ts" in the care of stainless. Cherry-Burrell Corp.

154 **So Bright, So Tough**—Bulletin 220 describes Neolac 600, a high-gloss, air dry enamel with exceptional weatherability for use on wood, metal, concrete. Stresses advantages of this coating, which is said to combine quick dry of a lacquer with hardness of a baked finish, and discusses its bond strength, chemical resistance, color range. Lists more than 50 uses for it, gives instructions for applying. Chamberlain Engineering Corp.

155 **Aluminum Paints for High Temperatures**—Two heat-resisting aluminum paints—an interior type for exposure to temperatures to 1000 F and an exterior paint for temperatures to 550 F are fully discussed in this folder. Also described are an acid-alkali resisting aluminum paint and one specially developed for painting rusted chain link fences. Prices, coverage given. The Skybryte Co.

156 **Heavy Duty Cleaner**—Form 124, 2 pp, presents manufacturer's industrial cleaner for use where large volumes of wet or dry material must be recovered before dumping, and recommended for cleaning coolant sump tanks, large areas, machine tools, castings. Includes specifications, operating data. Doyle Vacuum Cleaner Co.

WATER CONDITIONING

157 **pH Explained**—"The Meaning, Application and Measurement of pH" is the title of Bulletin 28X7636, a 3-pp informational leaflet. Non-technical, it contains tables showing different pH values of common acids and alkalies, the intensity of acidity or alkalinity, and the most desirable pH range of industrial waters for different conditions and application. Allis-Chalmers Mfg. Co.

158 **Organics in Water Treatment**—Here's an interesting folder describing the need for organics in altering the nature of sludge in order to make it non-adherent. Covers theoretical and practical consideration involved in use of organics and describes and illustrates manner in which they overcome problems of sludge. Power Div., R. P. Drew & Co., Inc.

159 **To Control Scale**—Illustrated Bulletin 100 stresses benefits of company's electric unit for controlling scale forming elements in boilers, heat exchangers, air conditioning systems and equipment using or cooled with water. Describes unit, tells how it works to prevent scale deposits. Gives capacity data. Aqua Electric Scale Control, Inc.

AIR CONDITIONING, DUST CONTROL

160 **Equipment for Air Conditioning**—Everything needed to do a job of air conditioning—cooling, heating, dehumidifying, cleaning, filtering, circulating; or ventilating or air handling—is covered in 16-pp Catalog SA-3692. Equipment listed is selected from manufacturer's full line. Includes selection data on hermetically sealed compressors, condensers, water coolers, heating and cooling coils, air handling units, dehumidifiers, washers, self-contained units, heaters, fans and inlet vane control assemblies. Sturtevant Div., Westinghouse Electric Corp.

161 **Industrial Dust Control**—In addition to citing several examples of how company's Dustube collectors are solving the dust control problem in different industries, Vol. 1, No. 1 of Industrial Ventilation, discusses eight advantages of the collectors. Also explains efficiency of cloth filtration. American Wheelabrator & Equipment Corp.

DIESELS, ACCESSORIES

162 **To Keep Diesels in Condition**—For owners of their diesels, this company has issued a service bulletin, "Protective Maintenance Increases Profits." Although this guide doesn't fit every operation, it gives a basic protective maintenance program. Discusses reasons why protective maintenance pays off and includes maintenance schedule check chart. Cummins Engine Co., Inc.

June, 1951

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163 Oil Reclaimer—An oil reclaimer for diesel or gas engines that's continuous, automatic and electrically operated is described in Bulletin R-238. Reclaiming process is explained and illustrated by full-color drawing. Also pictures other reclaimers, filters, purifiers. The Hilliard Corp.

164 Loading Resistors for Diesels—Eight-pp illustrated Bulletin GEA 5515 describes loading resistors for testing diesel-electric locomotive power plants. Outlines advantages of the loading resistor, uses, ratings and dimensions, and gives operating instructions. A description of the power connections, loading characteristics, instruments, blower unit, resistors and switches is provided. General Electric Co.

LUBRICANTS, LUBRICATING

165 Why Clean Oil—"The Facts about Clean Oil" is a 16-pp illustrated discussion of the long-run economy of clean oil. Explains how dirty oil wrecks equipment and how the removal of contaminants as they form can save equipment and cut losses. Discusses value of clean oil in quenching operations, in hydraulic systems, for diesel lubrication, for transformers and electrical equipment, for air filters, and for other applications. Honan-Crane Corp.

166 Molybdenum Disulfide—Available to plant engineers interested in molybdenum disulfide for purposes of lubrication is this 60-pp booklet of excerpts from technical papers. They cover such subjects as friction of solid films on steel at high sliding velocities, oxidation characteristics of molybdenum disulfide, effectiveness as a fretting-corrosion inhibitor, also friction properties of various lubricants at high pressures. Climax Molybdenum Co.

HEATERS, HEATING

167 Suspended Oil Heater—This bulletin describes manufacturer's Wondaire oil furnace which is suspended overhead from ceiling and centrally located with minimum ductwork. Stresses fuel economy, space utilization, other benefits. Gives specifications for eight models with 80,000 to 400,000 Btu output. Cox Mfg. Co.

168 Chart on Heating Costs—This handy 8-pp pocket-size chart provides a yardstick for quickly determining comparative costs of chief fuels used for heating buildings in the northwestern United States. It was compiled from figures taken from an impartial study conducted by an independent authority and takes into account the common differential factors; it is applicable wherever automatic heating equipment is used. Anthracite Institute.

169 Gas Fired Equipment—Catalog 51, 24 pp, illustrates and describes a line of burners, furnaces for hardening, tempering and annealing, valves, torches, mixers, and blowers. Includes ordering and application information. Explains in detail company's direct jet principle incorporated in burners. Johnson Gas Appliance Co.

170 Industrial Gas Burners—This file of 13 pp of data on gas burners covers their design, operation and installation. Includes capacity ratings and data and selection information on the line of burners which incorporate company's double air principle of gas firing. Describes circular flame burners, horizontal burners, sectional series types, ring burners, jet types. A section on manufacturer's Power Pak burner for horizontal firing stresses its versatility, showing some of the many types of boilers for which it is adaptable. Kilham Gas Burner Co.

HYDRAULIC EQUIPMENT

171 Pocket Manual on Air, Hydraulic Devices—If you didn't receive "The Facts of Life on Air and Hydraulic Devices" when it was first published a second printing of this popular 20-pp booklet makes it again available. It presents in concise, matter-of-fact style the "do's, don'ts and what to look for" phases of setting up and servicing power units, control and air valves, cylinders, lubricating units, chucks. Logansport Machine Co., Inc.

172 The Merits of Dual Pressure Boosters—The advantages of dual pressure boosters now manufactured from standard air and hydraulic cylinder components are highlighted in a 4-pp article, "Boosters and Their Practical Application." Savings in air consumed, savings on circuit valves, holding of pressures (to 10,000 psi) indefinitely, and adaptability in circuits of small to medium volume requirements are stressed. Circuit drawing, photos, and description of typical applications are presented. Single pressure boosters for small volume requirements and high speeds are discussed, as are methods of returning booster driven hydraulic cylinder, simplicity of maintenance. Miller Motor Co.

OTHER EQUIPMENT

173 Viscosity Packet—To give plant engineers as complete information as possible on company's viscometers and the general subject of viscosity this file of literature is offered. Includes an 8-pp catalog, data sheet, current price lists, "what users say" brochure and list of article reprints available from company files. Brookfield Engineering Laboratories, Inc.

174 Engineering Data on Packings and Gaskets—In addition to describing packings and gaskets, 100-pp Catalog P-100 contains charts showing recommendations for packing many types of equipment against a long list of services. Provides information on common causes of packing failure, advantages of lantern glands, proper installation procedure, temperature conversion and steam tables, water heads and equivalent pressures. Products made of Teflon, available as gaskets, rings and irregular shapes, sheets, tubes, rods, tape, braided and plastic packings and packings for stuffing boxes and valve stems are presented. Book is in loose-leaf style, has a leatherette cover, large illustrations. Raybestos-Manhattan, Inc.

175 Movies for Motion Study—How modern motion picture equipment is being used to advantage in measuring time accurately in time-and-motion studies is discussed in Form 5385, a 20-pp booklet on 16 mm cameras and projectors especially designed for industrial engineering applications. Describes and illustrates recommended minimum equipment outfit for motion study problems. Bell & Howell.

176 Design Data on Thread Inserts—Bulletin 650-B, 16 pp, covers design data on helical-wire thread inserts and their use in the protection and repair of tapped holes. Drawings and text explain how these inserts protect tapped threads in aluminum, magnesium, plastics, iron, steel and wood against stripping, wear, corrosion, seizing and galling. Also covered are uses in production salvage operations, maintenance, and repair work. Tabular data includes basic insert lengths, recommended drill sizes, roughing and finishing-tap specifications and gages to be used when installing various sizes and types of inserts. Heli-Coil Corp.

177 The Possibilities of Color Television—A new communications tool is presented in this 8-pp booklet introducing the use of the Vericolor television system. Technical training and visual education programs, the monitoring of hazardous operations are among its applications. Details on equipment and techniques are described and illustrated. Remington Rand Inc.

178 Power Bending Brakes—Twelve-pp Catalog P-51 illustrates and describes steel power bending brakes, power universal box and pan brakes. Besides complete specifications on standard sizes of machines, gives details on improved motor drive, better clamping methods employed, easier and more accurate controls. A wide variety of bending operations are pictured and a detailed description of how different pieces are handled and time required are included. Dreis & Krump Mfg. Co.

179 Film Type Heat Exchangers—Bulletin HE-7 offers 8 pp of information on film type heat exchangers explaining design principle. Actual installations of this type of exchanger described include power plants, chemical plants and a compression plant. Henry Vogt Machine Co.

180 What's What on Rubber Compounds—To familiarize plant engineers with wide range of company's rubber compounds, 16-pp Catalog 515R-1 lists by code number some 20 compounds representative of 500 rubber stocks developed to meet special requirements. Information is given on compounds featuring resistance to abrasion, chemicals, high and low temperatures, petroleum products and derivatives, and weathering. In each section are listed basic materials, general characteristics, suggested applications. Durometer hardness, strength and elongation of each stock before and after aging are tabulated. Also presented are facilities for custom fabrication of parts. The Stalwart Rubber Co.

181 Load Cells—Bulletin 324, 2 pp, describes, illustrates and gives specifications for company's new line of seven universal load cells, the Type U-1 SR-4, ranging in weighing capacity from 500 to 50,000 lb in tension and compression. The cells depend on electrical resistance measurements of SR-4 resistance wire strain gages bonded to the steel column. Baldwin-Lima-Hamilton Corp.

182 Freon Coolers—Catalog Section 101, 12 pp, is devoted to freon or ammonia coolers of the dry expansion type. In addition to describing and illustrating company's standard line, catalog contains charts and tables showing cooling surface required for 2 to 232 t of refrigeration at water flow rates from 15 to 575 gpm, and for various baffle spacings in single and two-circuit designs. A log mean temperature table, cooler selection data, dimensions, pressure drops, and some typical piping arrangements are included. Patterson-Kelley Co., Inc.

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(Continued from page 90)

directional lever. This control is mounted on steering column for selection of travel direction and simultaneous engagement of first point-of-power. It simplifies operation, increases maneuvering speed and permits fast getaway.

When driver's seat is vacated the control lever is blocked in neutral and a parking brake on motor drive shaft is set automatically. The truck can be moved only when seat is occupied or depressed. Over-all length of the Clipper, less forks, is 63-⅝ in. and width is 34½ in.; the wheelbase is 37 in.; turning radius 61½ in. Over-all height of standard uprights with forks down is 83 in., and 124-in. at maximum lift. Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.

AIR CIRCUIT BREAKER

With new air-delayed series overcurrent tripping device

Latest of manufacturer's DB line of breakers for application in low voltage industrial and commercial power distribution systems, motor starting duty and similar uses is the Type DB-50 with an interrupting capacity of 50,000 amp. The DB-50 has completely adjustable elements, company points out, and provides long-time delay on overloads and instantaneous tripping of fault currents.

The DB is rated at 600 v a-c, 250 v d-c and has a continuous rating of 100 to 1600 amp. It can be operated manually or by d-c solenoid or a-c Rectox solenoid. All parts are removable as complete units. For use on feeder and back-up breakers, overcurrent trip units including both a long-time delay and short-time delay element can be specified. Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

LIQUID EJECTORS

Deliver clean air-gas to instrument or pneumatic systems

Liqui-jectors in the new series are designed to clean large volumes and high pressures of compressed air other gases with contaminating water, free oil, water-oil emulsions and dirt. They deliver the clean air-gas through specially prepared liquid-impervious ceramic filters, company explains, liquids and dirt being ejected automatically. Selas Corp. of America, Erie Ave. and D St., Philadelphia 34, Pa.

LAMP STARTERS

For fluorescent lamps, operate at low temperature on a-c or d-c

Designed for fluorescent installations where some instant light is desirable, the Multi-Purpose Starters are said to prolong the life of the lamp by providing adequate pre-heating. Positive d-c starters, their normally closed starting circuit means that the lamp's ends light up immediately, it is explained, and they provide certain starting where ballast output is low or high.

SINGLE-ACTING JACK

For maintenance of industrial switches and spurs

Specially designed to speed up and simplify track maintenance, the Simplex Model 16A is an improved jack with very low minimum toe height—only 1½ in. This forged toe is low enough to let the jack be placed under the

rail without removing ballast, but it's large enough (2½ by 3½ in.) to stabilize the load.

Another feature is a trip operable from either right or left side, with operator protection by Over-all height of the new jack is 12 in., lift 16 in. It weighs 45 lb, has a lifting capacity of 15 t. Templeton, Kenly & Co., 1020 S. Central Ave., Chicago 44, Ill.

Solve toughest large scale ventilating problems

The low-contour Airmover gives you high-capacity air movement

You can have all the ventilation you want—at economical cost. Airmover exhausts large quantities of heat, smoke or fumes rapidly through its short-air-travel, low-air-friction construction. It's only 32 inches high, built in rectangular units that can be placed on any type roof.

Install any number of units in continuous runs. You literally can "open your roof to the sky", yet have full weather protection. Single units or shorter runs prove effective over specific "hot spots". The low contour and unusual flexibility have made Airmover the popular industrial ventilator. Write for Folder 326D.

The Swartwout Line includes a variety of gravity and powered ventilators.

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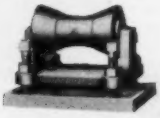
ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

NO. 1 OF A SERIES SHOWING THE GRINNELL LINE

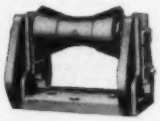
pipe rolls

Pipe Roll and Plate
Fig. 277
2 to 30 in. pipe

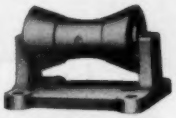


Adj. Pipe Roll with Base
Fig. 274
Without base: Fig. 275
2 to 30 in. pipe

Adj. Swivel Pipe Roll
Fig. 174
2½ to 12 in. pipe



Adj. Pipe Roll
Fig. 276
4 to 30 in. pipe



Pipe Roll Complete
Fig. 271
2 to 30 in. pipe

Single Pipe Roll
Fig. 171
1 to 30 in. pipe

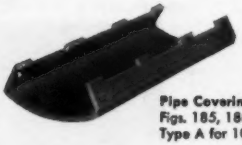
pipe saddles

Pipe Stanchion Saddle
Fig. 259
4 to 36 in. pipe

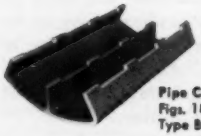
Adj. Pipe Saddle Support
Fig. 264
2½ to 36 in. pipe

Pipe Saddle Support
Fig. 258
4 to 36 in. pipe

Anchor Chair
Fig. 197
4 to 24 in. pipe



Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type A for 10 in. and smaller



Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type B for 12 in. and larger

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Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

They are made in three types: for 14, 15 and 20-w lamps; for 22-w Circline and 18-w Circlarc lamps, and for 13 30 and 40-w lamps. Sheldon Electric Co., Allied Electrical Products, Inc., Irvington, N. Y.

OVERLOAD RELEASE

Is mechanical device for use with company's reduction drives

This overload release is used on the reducer end of the torque arm and is so constructed as to engage the housing stud of the unit. The mechanism is preset for maximum torque of each size of company's reduction units and works equally well with torque arm mounted in tension or compression, company states, providing instantaneous release of unit upon any excessive jamming or shock loads. It is easily re-engaged without use of tools, company says, and will operate throughout the life of drive. The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

FLOW SIGNAL TRANSMITTER

Is pneumatically operated flow differential measuring unit

The High Pressure Flow Signal Transmitter is now being used in process industries, in the metallurgical field and in steam power plants. It is used for measuring flow differentials of liquids, gases or vapors, or for measuring static pressure or liquid level. Interchangeable measuring elements cover a continuous range of pressure differential from 5.5 in. water column to 100 psi, at static pressures to 1500 psig.

The transmitter consists essentially of an input differential pressure measuring unit, force balanced by an output system. Inertia of this balance system is negligible, company reports and since no manometric sealing fluid is needed, there is no contamination problem. Accuracy of measurement is given as within 1 per cent of full scale reading. Hagan Corp., Hagan Bldg., Pittsburgh 22, Pa.

MASTER REGULATOR

Is designed to save fuel by holding steam pressure where desired

For use wherever it is necessary or desirable to hold steam pressure at a certain prescribed level, the Model SC-B is described as especially applicable for process steam production where constant pressure must be maintained despite varying load demands. It is designed to regulate steam pressure automatically on any type of stoker, gas- or oil-fired boiler and, when installed with company's Lectricarm drive unit, to provide automatic modulation of fuel and air supply in direct proportion to pressure changes.

The pressure controlling unit consists of bellows, floating contacts, compensating motor and a pressure adjusting mechanism. According to the company, this steam control saves fuel by eliminating over-firing, by modulating fuel and air supply to the correct ratio to maintain combustion efficiency and by eliminating "start and stop" firing. The Model SC-B is easily installed, company says, and standard units are available for 110 or 220 v 60 cycle current, and for a wide selection of pressure range requirements. Cleveland Fuel Equipment Co., 7316 Associate Ave., Cleveland 9, O.

PORTABLE CONVEYOR

For fast handling of bags, boxes, bundles, bales and cartons

Compact size, light weight and mobility are features stressed for the Hytrol. It's designed for one-man operation and moving, and adaptable to handling materials in warehouse aisles and other small areas, and for between-floors

operation. It can be moved, or its angle of delivery changed while conveyor mechanism is in motion, manufacturer points out.

The Hytrol comes in five sizes, each of which folds to half its length, and the largest can be stored in an area less

NORGREN OIL-FOG LUBRICATION EXTENDS DIE LIFE MANY TIMES

Norgren airborne oil-fog CLEANS and COOLS the die as it lubricates!

Spiral binder SB-6, made by Spiral Binding Company, New York, coils galvanized wire thru carbide dies at linear speed of 3,500 inches per minute. It incorporates a Norgren Lubricator that injects an air borne OIL-FOG thru the dies with amazing results: **Die life is extended many times... Flaking is reduced to a minimum... Air flow maintains safe die temperature, and cleans the die of flakes and other foreign matter.**

The machine also employs a Norgren Regulator-Lubricator Unit to serve two air cylinders. Result: *"Top performance of our machine at negligible maintenance over millions of cycles of operations."*

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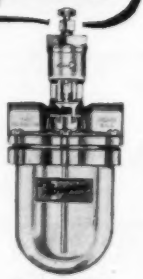

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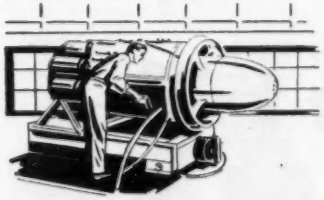
Some mighty tasty Swiss chocolates are made near Syracuse. And we're proud that American Blower HS Fans contribute toward their creamy goodness. In the making of fine candies, as with many other manufacturing processes, precise control of temperature and humidity is vital. American Blower HS Fans are an important part of this and other air conditioning jobs. Their non-overloading power characteristics and remarkable efficiency over a wide range save money.



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Why not call on American Blower to help work out the air handling assignments in your new defense plant? We've plenty of valuable firsthand experience. For example, an important new aircraft engine plant will shortly be using a large quantity of American Blower Sirocco and Vaneaxial Fans. Good ventilation is good business in your plants, too.

FAN PLAN . . .

If you haven't yet checked the advantages of using an American Blower Attic Fan in your business or home, do so. It's the lowest cost method of comfort cooling we know. No costly building alterations, no refrigerating machinery is used. All American Blower Attic Fans carry Certified Ratings; cost just a few cents a day to operate. Ask your electrical supply house or contact our nearest branch office.

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American Blower heating, cooling, drying, air conditioning and air handling equipment can do much toward improving comfort and efficiency in business. For data, phone or write our nearest branch office.

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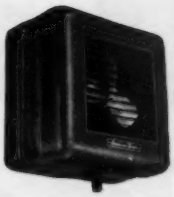
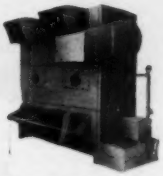
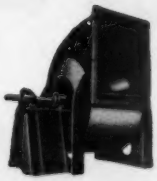


Unit Heaters

Ventura Fans



Air Conditioning Equipment



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Utility Sets

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than a half-yard square. It's built low to the floor to reduce lifting. It handles as many as 15 100-lb bags per minute. Seedburo Equipment Co., 618 W. Jackson Blvd., Chicago 6, Ill.

ALL-WEATHER HYDRANT

Is non-freezing, designed to protect water supply

This hydrant has no seep holes, manufacturer explains, so there's no possibility of water contamination. It is constructed to function at static water pressures from 25 psi to 130 psi, and temperatures from 100F to -70 F. A rubber sleeve enclosed in casing is used to insure operation during low temperature weather, since movement of the rubber upon introduction of water pressure breaks up any water inside the casing. The flow of water flushes out residual ice.

Working parts of this hydrant can be removed without disturbing buried casing, and internal assembly may be removed, if necessary, with crescent wrench. Hydrants come in ¾ and 1-in. standard sizes and for 2 to 9 ft depth of bury. J. A. Zurn Mfg. Co., 1801 Pittsburgh Ave., Erie, Pa.

WIRE SOLDER

For restoring galvanizing, especially where damaged by welding

Farco Galvanizing Wire Solder is described as forming a homogenous coat, showing no line of demarcation between it and the hot dip. According to manufacturer it will stand the 800 hr salt spray bath required of a good hot dip job without deterioriation.

This solder has a melting point only 17 deg F higher than 50/50 and a high degrees of fluidity, company says, and may be applied with torch or soldering iron. It may be used with company's ASMC all metal or Mayolyte flux on steel, iron, brass, copper, galvanize, pound. Farrelloy Co., 1225 N. 26th St., Philadelphia 21, Pa.

DIESEL ENGINES

Scheduled for production this year, offer design improvements

Advance information on company's Models D337 and D326 states that both engines will incorporate fuel pumps mounted adjacent to the cylinders they serve, to provide standard identical, short fuel lines for each cylinder. Pistons are oil-cooled, as in previous models, but feature a new arrangement, in which an iron band cast integrally for the upper ring, are cooled by an oil stream sprayed from a nozzle attached to the engine block. Since this spray lubricates the piston pin, oil grooves are not required in the connecting rod.

Fine filtration elements to handle full flow of oil to engine system are also incorporated and oil passageways are protected from dirt falling into them while filter elements are being changed. Any sludge will collect at bottom of cams where it cannot enter oil passageways or relief valves.

A redesigned 25 hp vertical gasoline starting engine is used with both models. The six-cylinder D337 is an industrial version of the 5⅛ by 6 in. engine developed as power source for company's DW20 and DW21 tractors. The D326, similar in design, will be offered with lower horsepower range. Caterpillar Tractor Co., Peoria 8, Ill.

• For "fresh air" workrooms, free from high humidity, smoke, steam, odors, or excess heat, let ILG help you. Expert ventilating engineers are nearby to make surveys and recommendations of America's finest air-moving equipment with capacities and mounting arrangements to meet your requirements. ILG-built motors have special characteristics for fan duty—making possible ILG's "One-Name-Plate" Guarantee. For quick action, call nearest Branch Office (consult classified directory) or send coupon today.

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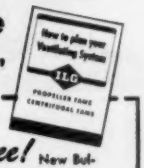

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Principles of Plant Layout

PLANT LAYOUT, Planning and Practice, by Randolph W. Mallick and Armand T. Gaudreau. Size 6 by 9½ in.; 371 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $7.50.

THIS IS a practical guide to help you arrive at the best layout and material-handling system for your plant. Conserving space, profitable use of plant services and a scientific analysis of material handling are the main topics stressed in attaining a satisfactory plant layout.

The book is broken down into four parts: Part I, Approach of plant layout; Part II, Planning the processing departments; Part III, Designing plant service facilities; and Part IV, Justifying the layout project.

Several chapter subjects are mentioned to give you some idea of the scope of material covered: planning the material-handling project; determining receiving, shipping and warehouse areas; maintenance facilities, tool cribs and sprinkler systems; power and lighting systems; and buildings for housing the plant layout. These and many other chapters will be of direct interest to the plant engineer.

The book shows how to design production and assembly lines; receiving, shipping and storage areas; and evaluates capital outlays for plant and equipment, operating costs and projected savings; and proposals for presentation to management.

Materials Handling Methods

MODERN METHODS OF MATERIALS HANDLING. Prepared by Material Handling Institute, Inc. Size 8 by 11 in.; 248 pp; illustrated; cloth bound. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price $5.50.

THE OBJECT OF this book is to provide a broader basic knowledge to the men concerned with materials handling and the methods which might be adopted for the job at hand.

The methods, types of equipment and materials described in this publication are in actual use, and the descriptions and pictures were obtained from many sources. These studies are not intended to be final

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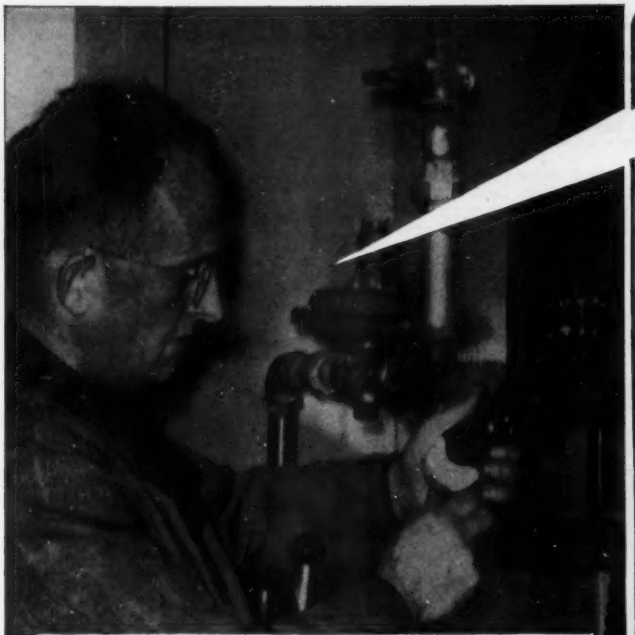

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or all-inclusive, but rather to stimulate greater progress within the field of materials handling.

The various materials handling studies contained in the book include numerous phases of industry; aircraft, automotive, beverages, building materials, drugs and chemicals, electrical, foundry, food products, glass, leather, metal products, oil and paint, paper products, printing and publishing, railroads, textiles, tire and rubber and warehousing.

This book should prove helpful in showing the many materials handling jobs which are being handled by other concerns in respective fields.

Ultrasonic Testing

SYMPOSIUM ON ULTRASONIC TESTING (STP No. 101). Size 5 by 7 in.; 133 pp; illustrated; paper bound. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $2.00.

THE TEN PAPERS and discussions included in this book represent a summary of the history, theoretical aspects, basic principles of practical testing, and practical applications for the ultrasonic testing of materials.

In his introduction, H. C. Amtsberg, Westinghouse Electric Corp., indicates these points: 1. Ultrasonic testing is being used very extensively today. 2. It is practical and is being applied intelligently by engineers in all branches and in a variety of industries. 3. It is not just another device which can be used for rejecting more material; it can and will aid and abet manufacturing. 4. Standard equipment is available which will perform very acceptably in the hands of nontechnically trained personnel of ordinary skill.

Several of the papers include appropriate lists of references and one bibliography is outstanding, constituting 342 references to the inspection, processing and manufacturing control of metals by ultrasonic methods.

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Corrosion of Materials At Elevated Temperatures

Symposium on Corrosion of Materials at Elevated Temperatures (STP No. 108). Size 6 by 9 in.; 120 pp; illustrated; paper bound. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $2.25.

THIS SYMPOSIUM resulted from an increasing awareness on the part of metallurgists and designers that the atmosphere in which a high-temperature component will operate must be carefully considered before a suitable material can be selected. In many cases, the corrosive aspects of the service will far outweigh the mechanical factors, such as creep and stress-to-rupture.

Many of the investigations presented were stimulated by gas-turbine developments, but unquestionably the work is applicable to other high-temperature activities. The behavior of materials in atmosphere from all the common fuels for mobile and stationary power generation are discussed, ranging from leaded aviation fuels to coal. The paper on corrosion by oil from residual fuels has attracted special interest due to the current seriousness of the problem in many industries.

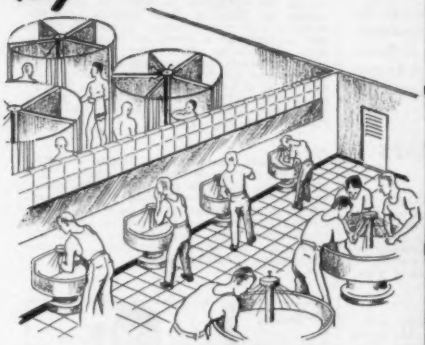
Personnel Management

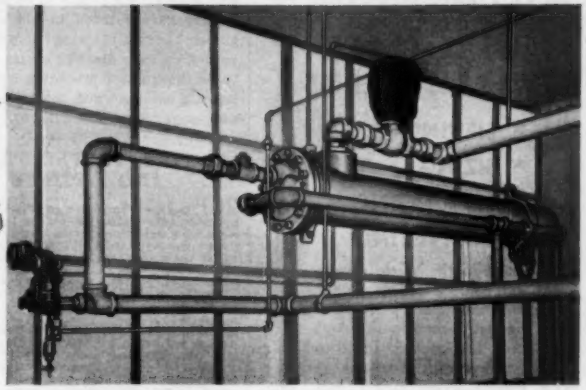
Developing the Company Training Program by Allen B. Gates. Size 8½ by 11 in.; 24 pp; stapled. Published by Research Div., California Personnel Management Association, 870 Market St., San Francisco 2, Calif. Price $1.00.

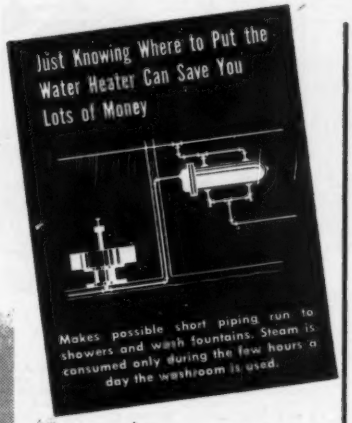
THIS IS A stenographic brief of address given by Allen B. Gates, training director, Eastman Kodak Co., before California Personnel Management Association and the Personnel Section of The Western Management Association.

Many helpful points are set down which will serve as a practical guide for any person wishing to review or set up a company personnel management group.

Plan Better Washrooms and Showers by having Lots of Hot Water at Low Cost



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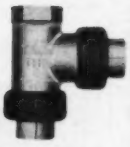

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DATA FILE

of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to aid plant engineers in maintaining a permanent, up-to-date data file. For copies of these, write the number preceding the desired bulletin on the card in the heavy insert, pages 37-38 and 103-104.

PIPING, VALVES, TRAPS AND FITTINGS

201 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercially available sizes of steel pipe. Tube Turns, Inc.

202 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculations, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

203 How to Choose and Use Air Traps—Bulletin 202 describes air trap selection and installation for automatic drainage of moisture from compressed air intercoolers, aftercoolers, receivers, separators and drip points. Armstrong Machine Works.

204 Steam, Air, and Gasoline Traps — Illustrated Catalog 250 describes several types of thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, piston-operated steam traps, also steam, air and gas separators. Includes capacity tables, installation diagrams. W. H. Nicholson & Co.

205 Strainers and Separators — Bulletin R-46-50A is a 16-pp catalog on T-type strainers, suction strainers, multi-flow and receiver separators. Contains dimensions, weights, prices. Shows how several types have been redesigned for increased efficiency. American District Steam Co.

206 Handbook on Fittings, Flanges—Catalog wf-1950, 88 pp. offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

207 Unions and Fittings — Twelve-pp Catalog 50 covers manufacturer's line of unions of all types, elbows, tees and fittings. Describes special construction features. E. M. Dart Mfg. Co

208 Solving Steam Trap Problems—This is the revised edition of manufacturer's popular 36-pp catalog on steam traps. Contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps with fewest number of fittings in shortest time —and how to service them. The V. D. Anderson Co.

209 Expansion Joints — Bulletin EJ-1912 is a revised 12-pp edition of booklet covering both gun-packed and gland-packed expansion joints. Fully illustrated, cites advantages of both types, discusses construction details, servicing. Includes dimensional data, weights, prices. Yarnall-Waring Co.

210 Pipe, Couplings, Joints — Composite Catalog 50 illustrates more than 500 ball-bearing swivel joints for temperatures from -25 F to 600 F and pressures from vacuum to 15,000 psi in sizes from ⅜ to 12 in. Also carries data on steel rotary hose, metal marine and barge hose, steel cementing and circulating hose, circulating heads and mud guns. Chiksan Co.

211 Handbook on Manual Valves—More than 40 pp of engineering data on manual valves for pressures to 6000 psi are contained in Catalog 1B-1. Covers shut-off, selector and manipulator valves. Explains and illustrates a pressure balanced self-aligning tubular valve seat which maintains intimate contact with an optically flat porting disc by which flow passages are opened or closed. Includes outline for determining valve size with tables giving steel pipe data, capacities of hydraulic rams. Barksdale Valves.

212 Valve Maintenance Guide — "Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

"You needn't worry about our oil reserve, Chief . . . we have at least 5 feet, 10 inches."

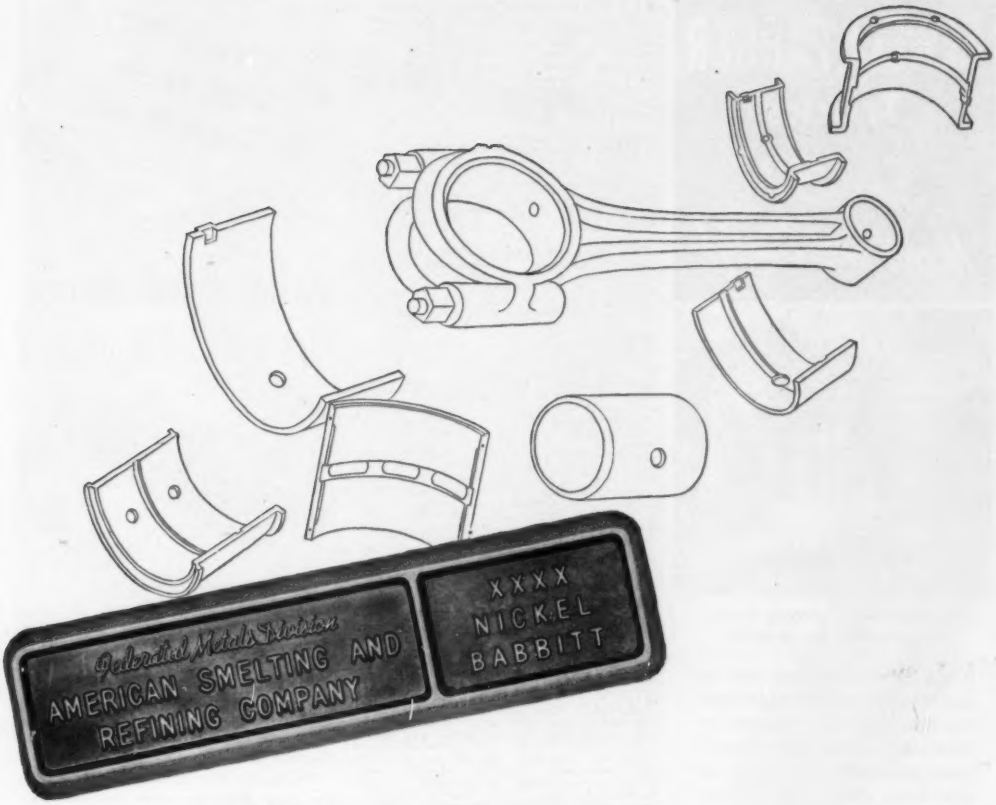
213 Forged Steel Valves—Form 800-A illustrates and describes 600-lb forged steel valves for high line pressure and temperature applications. Covers both inside screw and OS&Y union bonnet gave types, giving dimensions, prices. The Ohio Injector Co.

PUMPS, COMPRESSORS

214 Gas-Engine-Driven Compressors — Forty-pp Bulletin 104 introduces the HBA compressors, recent additions to company's "Big Angle" line of gas-engine-driven compressors. These are two-cycle high compression units designed for simplicity, compactness, easy maintenance and more power at lower cost. Describes and illustrates 5, 6, 8 and 10 cylinder models of 1100 to 2200 Bhp capacities. Lists major advantages. Includes specifications, dimensions. Clark Bros. Co., Inc.

215 Centrifugal Pump Care — Sixteen-pp Bulletin 08X6256A is a handbook on the care of all makes of centrifugal pumps. Tells how to figure head, determine friction loss. Discusses causes of troubles and their cures, includes maintenance time table. Tells how to prevent cavitation, common mistakes in packing stuffing boxes. Allis-Chalmers Mfg. Co.

216 Centrifugal Pumps — Single- and two-stage pumps for small boiler feed service, cooling tower service, bottle washing, brine circulation, general water service, hot well service are described in Bulletin W-306-B1. Includes ratings. Worthington Pump and Machinery Corp.



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217 How to Solve Pumping Problems — Form 3060 is a 130-pp manual on selection, use of pumps. Tells type of pump construction best suited for handling 150 liquids. Explains how to determine size, compute suction list and discharge head, determine direction of rotation and size or speed of pulleys or gears. Gives instructions for installing rotary pumps, locating trouble. Geo. D. Roper Corp.

218 Condensation Return Units—Bulletin 113-ST describes and illustrates packaged condensation return units for small, low pressure applications, and covering pump capacities of 1½ to 22½ gpm. Gives specifications, dimensions for company's Simplex Duplex units. Aurora Pump Co.

219 Rotary Pumps—The operating principle, advantages, construction features and range of applications of standard, heavy duty and special rotary pumps are explained in illustrated Bulletin 51-S, 8 pp. Includes dimensions. Viking Pump Co.

220 Stainless Steel Pumps — Centrifugal pumps described and illustrated in 8-pp Bulletin 725.3 are designed for handling corrosive liquids. Pump design is explained and parts identified. Specifications, dimensions and performance curves included. Goulds Pumps, Inc.

221 Centrifugal Pumps—Described and illustrated in Bulletin 50-9900 are a cross section of an extensive line of centrifugal pumps. Includes heavy-duty Bilt-on pump, a pneumatic sponge pump, deep well and submersible pumps, also boiler feed, process, stuffingboxless, and sump pumps. Byron-Jackson Co.

INSTRUMENTS, CONTROLS

222 Pressure Regulator—Bulletin 1-B, 8 pp, discusses design, operation and uses of a super-sensitive pressure regulator. Also covers a compound regulator for controlling back pressure relief valve and high pressure make-up valve. Atlas Valve Co.

223 Industrial Control Devices — Catalog 8303, 64 pp, presents 100 models of non-indicating electric, electronic, and pneumatic controllers for flow, pressure liquid level and humidity applications. New instruments shown, include electronic temperature controllers. Illustrated, includes engineering data. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

224 Time Saving Volt-Ammeter—Manual 110, 16 pp, "How to Make Your Job Easier with the Amprobe," describes the handiness of this pocket-size volt-ammeter in installing, repairing, servicing and maintenance of electrical equipment. Pyramid Instrument Corp.

225 Air Locks—Bulletin S-31, 2 pp, describing air locks and trip master controls for holding regulating and control valves in position during failure of air supply, is illustrated with photos, diagrams, line drawings. The Swartwout Co.

226 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature, pressure, low water, liquid level, boilers; transformer-relays, control valves, mercury switches. The Mercoid Corp.

227 Water Temperature Control—How to regulate cooling water system of diesel and gasoline engines and air compressors with company's water temperature control is explained and illustrated in this bulletin. Regulators and dial indicating thermometers shown. The Powers Regulator Co.

229 Electrical Instruments — A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters, matched a-c and d-c portable instruments, also current transformers, light meters. Includes application information, ordering data. Weston Electrical Instrument Corp.

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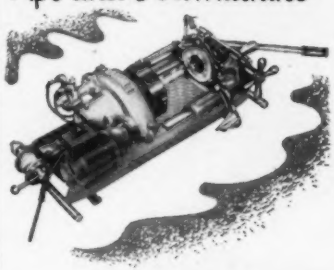

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The Model "E" uses the same dieheads—the same dies—the same patented interchangeable wheel-and-roller or knife cutoff devices—the same reamer arm and cone—as the Models A and B. This will be a great advantage to thousands of shops now equipped with the Beaver Model A or B because it eliminates the necessity of carrying in stock duplicate dies and parts—thereby preventing endless confusion and needless expense. And remember, there are 195 different kinds and sizes of dies instantly available for Models A, B or E.

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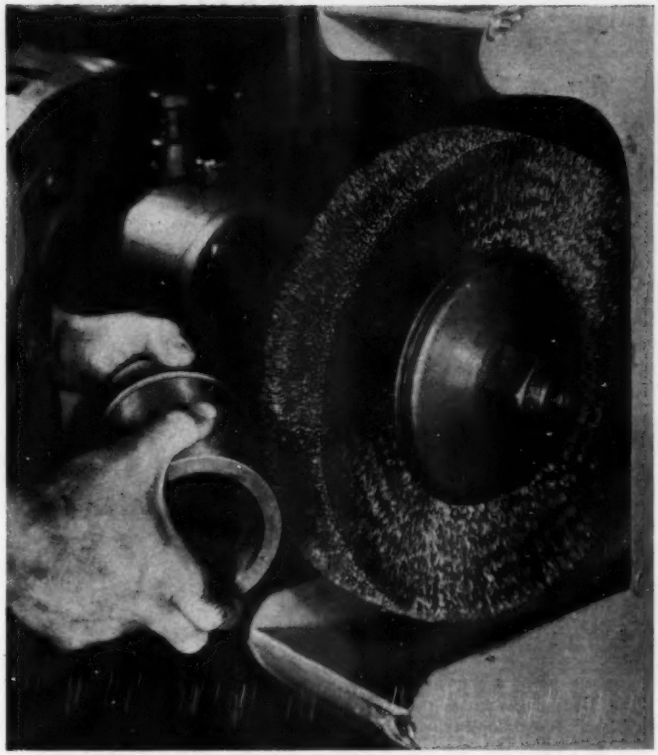

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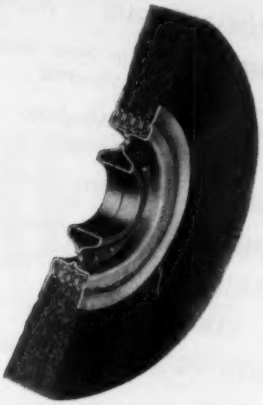

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231 **Control Instruments**—Form F-1753-2 is a 36-pp catalog on controls for heating and air conditioning and presents both ordering and general engineering information. Equipment described and illustrated includes thermostats, motor operated and solenoid valves, control motors, linkage for dampers, control systems and packaged units, program switches and accessories. Barber-Colman Co.

ELECTRICAL

232 **Motor Handbook** — Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Includes prices. Wagner Electric Corp.

233 **Power Distribution Feeders** — Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction, engineering, application data. The Trumbull Electric Mfg. Co.

234 **Precision Switches**—Twenty-pp Catalog 81 covers industrial switches for a-c circuits. Describes general purpose basic switches, auxiliary actuators, enclosed, explosion-proof and splash-proof types, limit switches, small switches. Includes technical data, prices. Micro Switch.

235 **Electric Motor Lubrication Studies**—Bulletin 1579 shows comparative amounts of lubricant in different designs of bearings, how bearings are subject to air circulation. Explains company's Lubriflush principle. U. S. Electrical Motors, Inc.

236 **The Why of Dry Type Transformers**—Booklet B-4428, 24 pp, discusses reasons why dry-type transformers are safer and less expensive to install and maintain in industrial plants and utilities. Air-cooled transformers for every use are illustrated from small ones to power centers of 10,000 kva. Also describes sealed, submersible units. Westinghouse Electric Corp.

237 **Small Bus Duct**—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also strap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

238 **Selector Switch Data** — This folder of engineering information includes target sheet to aid in understanding company's push-pull selector switch. Features explanation on how switch provides single master control serving up to 16 operations. The Arrow-Hart & Hegeman Electric Co.

239 **Distribution Duct Engineering Data**—Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating, diagrams, layout symbols. BullDog Electric Products Co.

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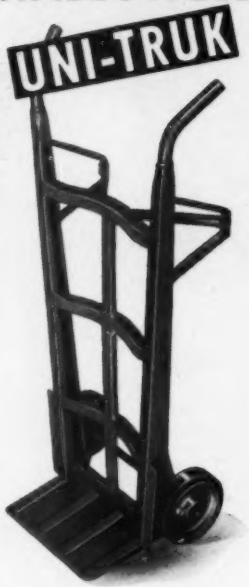

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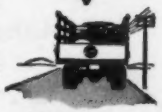

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240 Plug-In Power — Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Includes specifications, mounting data. Feedrail Corp.

241 Power Circuit Transformers — Bulletin 501-15, 12 pp, gives descriptive information on auto and double wound dry type power circuit transformers. Includes tips on converting, isolating service, selection, also wiring diagrams, dimensions. Jefferson Electric Co.

242 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings listed are those most frequently required. Excellent selection data, dimensions, ratings and prices. General Electric Co.

243 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable types. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. A technical section gives standard reel sizes and capacities, standard wire and cable specifications. Rome Cable Corp.

244 Retractile Cords—Bulletin KKG describes and pictures some of the applications for permanently coiled, neoprene jacketed electric cords which expand to about 5 times their retracted length. Koiled Kords, Inc.

MECHANICAL POWER TRANSMISSION

245 Chain Drive Manual—Catalog SCE-50, 68 pp, on chain drives, cites advantages and recommends applications. Gives information on chain length calculations, installation and maintenance, ratings, chain types, pitch and sprockets. Includes prices. Whitney Chain & Mfg. Co.

247 Brakes and Brake Motors—Construction advantages of company's brakes are featured in illustrated Bulletin SE-610-1 on brakes and brake motors. Explains greater wear resistance afforded by bonded metal brake linings. Dimensions, mechanical and electrical characteristics, mounting data. Crocker-Wheeler Div., Elliott Co.

248 Longer Life for Bearings — Bulletin 57B describes an economical three-step metallizing process which provides hard, oil holding surfaces for new and worn bearings. Metallizing Engineering Co., Inc.

249 Manual on Power Transmission Machinery — Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering, selection, ordering information: includes formulas. Dodge Mfg. Corp.

250 Power Drive Handbook — Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

252 Handbook on Chains and Sprockets —An excellent reference book is 216-pp Catalog A418. Discusses various chains and their service applications, metals used in them, and factors affecting their efficiency. Gives selection information on chains for drives and for elevators and conveyors. Engineering data includes dimensions, strengths and weights on a wide range of chains, sprockets and attachments. The Jeffrey Mfg. Co.

253 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

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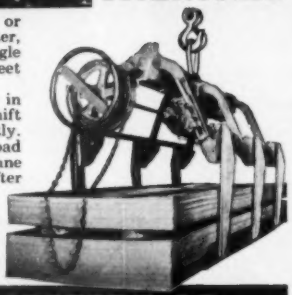

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254 Variable Speed Control — Twelve-pp Bulletin G-509, 12 pp, describes basic operating principle of company's variable speed drives and contains representative rating tables and dimension drawings. Covers capacities from ¼ to 87 hp with stepless speed changes within ratios from 2 to 1 to 16 to 1. Presents three basic units and controls. Reeves Pulley Co.

MATERIALS HANDLING

255 For Efficient Overhead Handling — Bulletin C-1, 56 pp, pictures overhead equipment for practically all industries. Stresses construction, safety, electrical advantages of trolleys, cranes, track and auxiliaries. The American MonoRail Co.

256 Handling Equipment Ordering Book —Ninety-pp Catalog 23 describes power trucks, power jacks, stackers, cranes, hand trucks, platforms, storage racks. Fully illustrated. Lewis-Shepard Products, Inc.

257 Manual on Electric Hoists — Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls; gives dimensions. American Engineering Co.

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259 Handbook on Overhead Conveying Systems — Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering and application data. Richards-Wilcox Mfg. Co.

260 Trucks, Casters, Wheels — Catalog 50, 64 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

261 Portable Hoists — This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions, operating advantages. Keller Tool Co.

262 Fastenings for Conveyor Belts — This collection of data covers hinged fastenings, repair plates, lacings, hooks, round belt couplings, also lacers, cutters. Gives instructions for use. Armstrong-Bray & Co.

263 Fast-Working Hoists — Bulletin W-815-B, 6 pp, provides electrical details on company's hoists — on wiring, brakes, motors and fast-operating, push-button controls. Standard, outrig. and multi-speed controls, limit switches are described. Hoist & Crane Div., Robbins & Myers, Inc.

264 What's New in Mechanized Handling —Vol. 1, No. 1 of Material Handling News, a house organ, is a report on company's new handling equipment. Among subjects covered in the 28-pp illustrated booklet are the Dynatork Drive, which transmits engine power to the drive-axle by magnetic induction; powered hand-pallet trucks with motor mounted in the wheel; the Pul-Pac which handles loads without conventional pallets. Industrial Truck Div., Clark Equipment Co.

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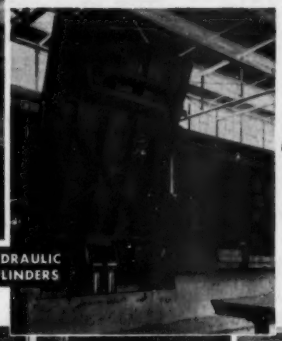

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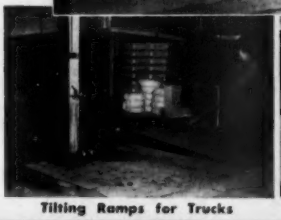

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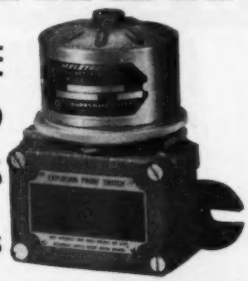

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265 Conveying Systems Manual—Unloading and conveying of dry pulverized material are discussed in 24-pp Bulletin PK-25. Text covers system and operation; stationary pump, accessories. Fuller Co.

266 Racks for Storage—Sixteen-pp Bulletin 104-C-48 shows by text and photo how company's steel racks improve storage facilities, illustrating many installations. Includes dimensions, also describes and pictures special racks for special handling problems. Economy Engineering Co.

267 Conveyor and Elevator Belts—This 26-pp collection of catalog sections illustrates parts used in construction of company's conveyor and elevator belts. Discusses features, increased service life and decreased maintenance. Covers cord, material, hot material, food handling conveyor belts, grain conveyor and elevator belts, industrial elevator belts. The B. F. Goodrich Co.

268 All-Around Bulk Handler—Catalog Supplement 8065, 16 pp, describes the Dumpster, a truck-mounted carrying and dumping unit which does the work of several trucks by means of interchangeable containers. Shows how different containers handle a wide range of bulk materials, solids, liquids, dusts, etc. Dempster Bros.

269 Tiering Made Easy—Company's improved Model 230 Jeep, a 2000-lb capacity tilting-tiering truck with 130-in. fork elevation is described in Bulletin 295. Illustrates increased visibility, short turning radius. Specifications, dimensions. Mercury Mfg. Co.

270 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belt; covers raised edge and flight constructions, chain edge constructions, high temperature belts, wire conveyor aprons. Includes photos, data on weaving limits, weight, mesh openings, take up for wire conveyor belts. Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp.

271 Data on Truck Casters—As much specific information as can be presented in a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data, and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. Covers light, medium, and heavy duty, sprung wheel, track and special types, wheels, locks, brakes. The Bassick Co.

272 Hydraulic Jacks—Hand, wheeled and gage-equipped jacks from 1½-t capacity models to 100-t capacity extra-heavy duty jacks are covered in Catalog J-50, 16 pp. Illustrated, includes specifications, selection information. Explains construction features. Blackhawk Mfg. Co.

273 Sheet Lifters—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. More than 80 installation photos show sheet lifters in use, also lifters for tinplate, coiled stock, special jobs. Includes dimensions. Cullen-Friestedt Co.

274 For Easier Loading—Full information on adjustable loading docks which speed up freight handling and "mechanize" loading operations is given in this bulletin. Shows present models of manufacturer's Adjust-A-Docks. A discussion of their advantages—savings in dock space, handling time, labor and breakage—is included. Design and construction features, operation covered. Rowe Methods, Inc.

CONSTRUCTION

275 Roofing Manual—Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

276 Building Panel Engineering Data—This 40-pp reference book on use of steel and aluminum panels for walls, decks and roofs, discusses their use, advantages, methods of installation. Covers acoustically treated panels, fire resistance ratings, electrification, acoustic roofs, reinforcing floor forms. Fenestra Building Products Co.

277 Glass Block and Where to Use It—This 32-pp book gives design data, information on functional and decorative aspects of glass block. Covers properties, specifications, erection procedures. Insulux Div., American Structural Products Co.

278 Walkways and Loading Racks—Part I, Section 6 of Catalog 54, 36 pp, gives application suggestions on pre-cut steel material for on-the-job erection into walkways, stairways, loading racks; instructions, layouts. Black, Sivalls and Bryson, Inc.

279 Technical Data on Plexiglas—This is a file folder of information on Plexiglas sheets, rods, molding powders, covering workability, properties, thicknesses. Discusses large area lighting. Rohm & Haas Co.

280 Building Construction and Maintenance Manual—Here's a 112-pp illustrated manual packed with facts on concrete and wood floor treatments, paints, protective coatings, concrete and mortar admixtures, waterproofing and dampproofing, caulking compounds, and roof coatings. Indexed, estimating guides on floor treatments and roof coatings, brick requirements, timber requirements and watercement ratios. L. Sonneborn Sons, Inc.

282 Technical Manual on Plywood—Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

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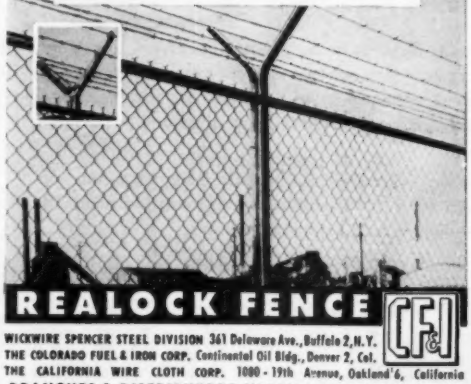

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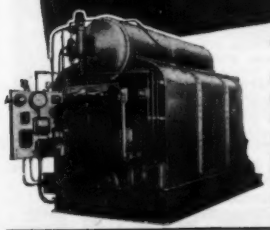

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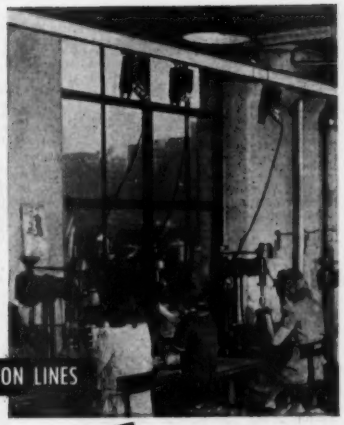

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283 Fastening Tips—This recent issue of company's house organ relates some interesting case histories on the use of company's fastening system. Also describes a new safety shield and dual-action tool. Ramset Fasteners, Inc.

MAINTENANCE

284 Drip Preventive Handbook — Insulation of pipelines, tanks, cold air conditioning ducts and wall surfaces against corrosion and condensation drip is covered in pocket-size 32-pp Form P-17. Describes coatings, tells how to apply. Includes coverage tables. J. W. Mortell Co.

285 Painting with Aluminum — Form AD-228, 28 pp, tells how and where to use aluminum paints. Covers painting of metal, concrete and masonry and other nonabsorbent surfaces; of weather-exposed wood, and of interior heated surfaces. Aluminum Co. of America.

286 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

288 Building Maintenance — Handbook 7, offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

289 Before Your Next Paint Job—Catalog P5130 offers plant engineers many a helpful hint on points to be considered before undertaking a paint job. Illustrated with photos and sketches, covers such factors as principles of contrast control and how to apply them, keeping costs down, exterior painting. The Tremco Mfg. Co.

290 Protective Coatings — This bulletin offers concise information on Gilsonite- and mica-based coatings for protecting heavy industrial equipment against corrosion, and sealing walls. Discusses general properties; includes selection table covering more than 25 coatings, giving applications, special features, coverage. Insul-Mastic Corp. of America.

291 Power Brushes—Bulletin C-289, describing company's new line of power brushes, contains photos showing their design and use. Ordering instructions, specifications included. The Osborn Mfg. Co.

292 What's Your Corrosion Problem?—This small folder on rust preventives for protection of metal surfaces presents both the oil film and petrolatum types, telling how each is used, giving recommended uses. Gulf Oil Corp., Gulf Refining Co.

293 Corrosion-Preventive Coatings—This 16-pp illustrated booklet covers a family of products for fighting corrosion. Presents characteristics and application data on hot and cold applied tar base coatings, alkyd resin coatings, chlorinated rubber base coatings, vinyl and phenolic coatings. Includes finder chart which summarizes principal characteristics and uses of the various coatings. Protective Coatings Div., Pittsburgh Coke & Chemical Co.

VENTILATION, DUST CONTROL

294 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

296 Weatherproof Power Exhausters — Featured in this 8-pp bulletin are direct-drive exhausters so designed that the motor is out of the line of air flow to avoid damage by moisture and corrosive fumes. Engineering data includes recommended average air changes, air velocities required for exhaust hoods, rating table, specifications, uses. The Gallaher Co.

297 Dust Collectors — Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk and Blum Mfg. Co.

298 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

299 Electric Blowers — Illustrated Bulletin 573 describes portable electric blowers in ½ to 1½ hp sizes for removing dust, dirt, grit and grindings from motors, bearings, gears. Breuer Electric Mfg. Co.

300 Vacuum of Many Jobs — Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

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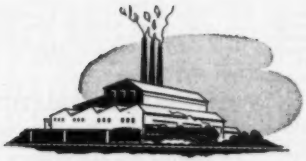

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301 Dust Recovery — "Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Explains what dust is and how company's equipment handles it. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency. Buell Engineering Co., Inc.

302 Dust Control Technology—Detailed selection, operation, and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment; exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Discusses control of air movements, recommended hood and enclosure design, exhaust air velocity and volume and rules for installing system piping. Presents methods for testing and evaluating exhaust system effectiveness, recommendations on periodic check-ups. Pangborn Corp.

WATER CONDITIONING

303 Hydrogen Zeolite Softeners — Publication 4530, 16 pp, presents hydrogen zeolite (cation exchange) water softening equipment. Gives a complete description of the process and the field of application, showing advantage of hydrogen zeolite softening and its relation to older sodium zeolite softening process. Provides an exhaustive explanation of the new process and details of equipment used in the process. Cochrane Corp.

304 For Conductometric Determination of Solids—A quick and simple method for determining solids content of boiler water or condensate is explained and illustrated in Bulletin 2RE50. Test procedure utilizes conductivity meter in conjunction with a cell, dial thermometer, conductivity cylinder and reagent. Hall Laboratories, Inc.

305 Scale Formation—This is a technical article on mechanics of scale formation, corrosion, other attacks on boiler metals, and how de-scaling unit works to correct, eliminate them. Butler Engineering Co.

PACKINGS, SEALS

306 Data on Packings — Form 428 is a collection of bulletins on flexible metallic packing, semi-metallic packing, rotary mechanical seal, oil pressure system and steel packing tools. Includes engineering data. Durametallic Corp.

307 Oil Seals and How to Use Them — Bulletin PK-46A, a 16-pp handbook, provides photos showing where to use oil seals and how to install them. Drawings show how lip and heel construction of seals can be varied. Johns-Manville.

308 Handbook on Mechanical Packings—This 32-pp booklet describes mechanical packings, including a process packing which is self-forming, self-lubricating, self-sealing. Illustrated, provides ordering, application information; includes recommendation chart. Packing Div., Flexrock Co.

309 Long Wearing Piston Packing — Form 4502, 8 pp, stresses use of company's composition cups for packing the pistons of air and hydraulic cylinders and reciprocating pumps. Engineering information covers properties, textures available, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

310 Mechanical Seals for Rotary Shafts —Illustrated with cutaway drawings, this 12-pp booklet covers seals of the positive, chevron, and o-ring types, giving specifications. Shows typical applications, special uses. The Garlock Packing Co.

311 Buyer's Guide on Packings—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings previously available only in product bulletin sheets, and includes data on a new packing for liquid pistons on inside-packed piston pumps. Self-lubricating, molded and special packings are covered in detailed text. Greene, Tweed & Co.

FUELS, LUBRICATION

312 Viscosity of Fluids—The larger significance of viscosity is discussed in Nos. 5 and 6, Vol. 36 of Lubrication, a technical publication. Illustrates simplest conception of streamline flow between two surfaces having relative motion. Shows how viscosity is measured. The Texas Co.

314 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricant requirements of equipment in 25 major industries —from bottling plants to sawmills. Also discusses use of a heavy-duty motor oil. Lubriplate Div., Fiske Brothers Refining Co.

315 The Why, What and How of Lubricants — This 20-pp booklet explains and illustrates common tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization, number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Tide Water Associated Oil Co.

316 Lubrication of Air Compressors— Technical Bulletin B-2 is a 40-pp text on air compressors and pneumatic tools. Written in non-technical language and clearly illustrated, it explains the principle of air compression, and tells how it is put to use. Discusses lubrication of compressors, touching upon lubrication systems, choice of oils and good maintenance procedure. Lubrication recommendations for pneumatic tools are included and there's a section on company's industrial lubricating oils and greases telling applications for each product. Sun Oil Co.

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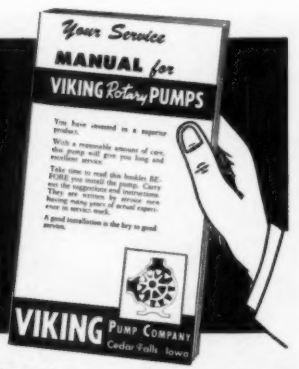

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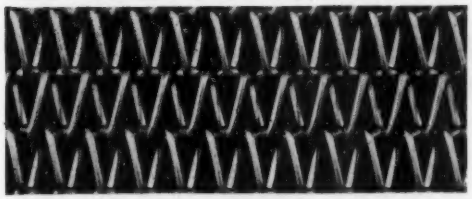

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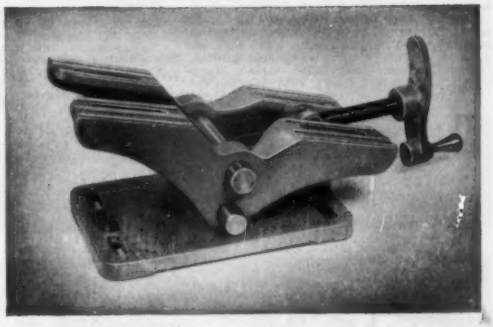

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317 Tool Catalog — Hand and power tools, tool sets, kits and related equipment are presented in 110-p Catalog T. Includes descriptive, ordering and application data. Snap-On Tools Corp.

318 Re-Circulation Steam Generator — Here's a 6-pp folder introducing a controlled re-circulation steam generator, describing its development and recommended uses. Illustrated text explains operation. Combustion Engineering-Superheater, Inc.

319 Group Washing Equipment—Washfountains designed for modern group washing requirements for industrial plants and institutions are described and pictured in Bulletin D-766. Hand- and foot-controlled models included, available materials listed. Bradley Washfountain Co.

320 Wire Cloth and Screens—This 48-pp handbook offers plant engineers valuable help in selecting and ordering industrial wire cloth and woven wire screens. It's generously illustrated with photos showing wire sizes, spacing, weaves and crimps and types of openings. It discusses applications of these different types, and metals used. Technical data includes weights of copper, brass and wrought iron wire per 1,000 ft, a table of wire gages, and an inch-millimeter conversion table. Korb-Pettit Wire Fabrics and Iron Works, Inc.

321 Steel Cabinet Benches—Construction features of steel benches are covered in 8-pp Bulletin 702. Six models are illustrated with dimensions and available top materials given. Also cataloged are sliding doors, tiers and shelves. Standard Pressed Steel Co.

322 Plumbing and Heating Supplies—Edition F is a 118-pp catalog listing over 2500 repair parts and precision tools for maintenance of all types of plumbing fixtures. Fully illustrated, covers replacement parts used in faucets, shower mixing valves, toilet tanks, flush valves, and plumbing connections for basin and sink fixtures. Includes products for plumbing fixtures. J. A. Sexauer Mfg. Co., Inc.

323 Elevated Steel Tanks—Welded steel tanks with ellipsoidal bottoms and roofs are presented in this 24-pp booklet as an economical means of increasing plant water storage capacity, maintaining uniform pressure, meeting peak loads and reducing pump costs. Full color illustrations show seven models. Location of tanks, distributed storage, fire flow requirements, dual storage piping, accessories, maintenance are discussed. Capacity table included. Chicago Bridge & Iron Co.

324 Packaged Generators—Bulletin SB-38 introduces company's new Keystone model. Photos and sketches show complete unit, pressure element and details of its compact design. Gives advantages of two-drum water boiler, three-pass gas travel, automatic gas or oil burner. Dimensions, capacities. Erie City Iron Works.

325 Vacuum Blasting — The efficiency and economy of vacuum blasting equipment for cleaning of equipment and other maintenance jobs, weld preparation, and conveying of granular material, is presented in this bulletin. A flow chart illustrates operation of a complete vacuum blasting unit-gun, generator, separator, dust collector. Vacu-Blast Co., Inc.

328 Unit Heater Selection — Sixty-pp Bulletin DS-327B tells how to choose propeller-type unit heaters, where to locate them and how to install them. Shows how manufacturer's heaters are constructed, explaining design features of diffusers, coils. Covers heaters for ventilation with duct work, piping details, controls, maintenance tips, steam and hot water capacities. Also provides roughing-in data. The Trane Co.

329 Case Histories on Brushing Problems—The solutions to 12 industrial brushing problems are told in this 32-pp illustrated booklet. Shows how rotary wire brushes, specially selected or engineered for the job, are used to clean welds in meat handling equipment, to finish stainless steel sheets, to put a satin finish on brass fixtures and to perform other abrading, cleaning and finishing jobs. Brush Div., Pittsburgh Plate Glass Co.

330 Four Handy Guides for Plant Engineers—Bulletin 20B6051J, 12 pp, offers data on figuring V-belt drives; Bulletin 51B-6025K, 12 pp, for quick selection of electric motors; Bulletin 52B6059E, 16 pp, for selection of centrifugal pumps, and Bulletin 25B6051B, for power generation, distribution and control equipment. Specify booklets wanted. Allis-Chalmers Mfg. Co.

331 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Sectionalized for easy reference, utilizes over 247 photos and drawings to show construction principles, operating features, typical installations, modifications and component parts for both indoor and outdoor units. Unit packages for diversified outdoor lighting are described. Shock absorbers, pulleys, rigid and adjustable suspension fittings are presented. The Thompson Electric Co.

332 Pipe Tool Ordering Guide—Newly-published Catalog, 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs, and wrenches, giving dimensions, selection information. Fully illustrated, includes current price list. Armstrong Bros. Tool Co.

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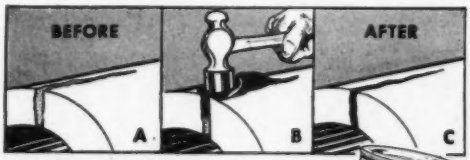

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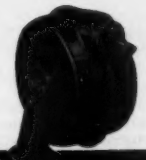

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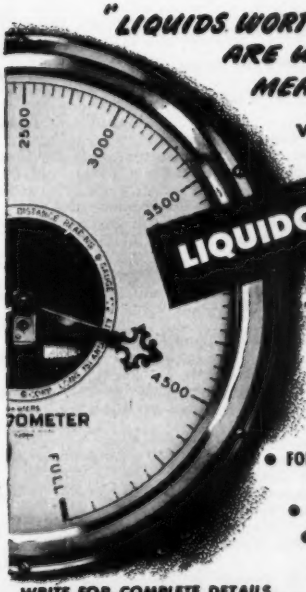

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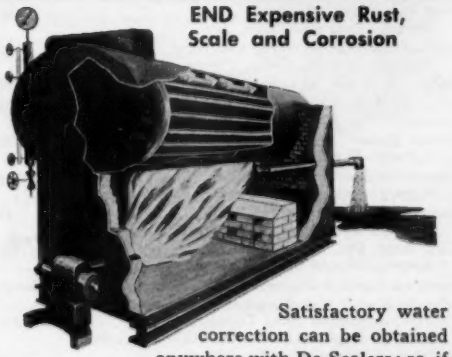

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Lockheed uses 6 Sky-Blasts for air movement at Burbank plant

Lockheed believes in advanced design in ventilation as well as in planes. Six new Propellair SKY-BLASTS were recently installed on Building 93 at Lockheed Aircraft Plant, Burbank, California. These units each move 28,800 cubic feet of air per minute, regardless of wind conditions.

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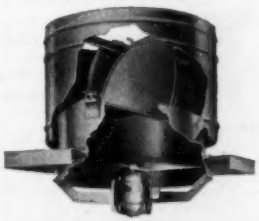

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'ROUND ABOUT

with the editors

(Continued from page 4)

be considered a phase of industrial engineering. Yet we prefer a more specific breakdown more in keeping with modern industrial organization.

Mr. Burns, one of the leading management consultants in the country, some time ago gave a talk in which he divided all the engineering functions in modern industry into four groups: research and development engineering which is self-explanatory; manufacturing engineering, dealing with new processes, methods and equipment; industrial engineering, dealing with labor, materials and overhead; and plant engineering, briefly described as the planning, installation, and maintenance of utilities and facilities.

As to specialization: What does a young, prospective plant engineer require from the educational system? We know plant engineers who were educated as chemical, mechanical, electrical, mining, civil or industrial engineers. A very large proportion are graduates of that well-known institution, the School of Hard Knocks. We even know one plant engineer who started his career as an accountant, and another as a lawyer.

Being one of those numerous individuals who acquired a semblance of an education, the hard way over a long period of years, we certainly would not say that a college education was wasted effort. We do believe, however, that of recent years much engineering college work has been too specialized, and that very few of the graduates end up in the line of endeavor in which they were primarily interested.

As long as one receives a fundamental education in engineering fundamentals, the exact type of education does not seem too important. We would, however, like to hear from our readers as to what general subjects they would insist upon if they were laying out a college course for a prospective plant engineer.

News of the Plant Engineers Clubs

Dayton: Members of Miami Valley Plant Engineers Club were guests of Standard Register Co. on their April 24th meeting, with a fine attendance of 16 members. After the dinner, they conducted a conference type meeting which was of great importance to each member. The group resolved tentative by-laws, membership limitations, officers, committees, schedule and location of meetings, dues and program. The May meeting will be held on the 24th.

Chicago: The Chicago Plant Engineers Club held an interesting meeting on May 4th, in which they formally adopted a constitution and by-laws. The officers elected during this meeting were: TED RAMOND, chairman; DON BROWN, secretary-treasurer; H. E. BYRNE, vice-president; HOMER B. ZOETER, senior board member; and W. M. ANDERSON, junior board member.

The next meeting will be held on June 8, at which time the program will be organized for the coming year.

Conference on Industrial Organic Finishing

THE BRISTOL Foremen's Club of Bristol, Tenn.-Va., with the cooperation of the University of Tennessee is sponsoring The Southeastern Conference on Industrial Organic Finishing. The conference is to be held on June 13, 14 and 15, and will include product and maintenance finishing.

Addresses and discussion groups for the three days will include: 1st, surface preparations, 2nd, painting equipment, and 3rd, finishes. Plant tours and a banquet on Friday the 15th will conclude the conference. For additional information please contact R. K. Cooper, Monroe Calculating Machine Co., Box 191, Bristol, Va.

Would You Like to Be an Editor? We Need Another on Our Staff!

THERE IS an opening on the Plant Engineering editorial staff for a young man of around 30 yr of age who has a good personality and common sense and who likes to meet people, travel and write. He does not have to be a gifted author but must be able to write clear and concise English. He should have: an engineering education; at least 4 to 6 yr practical experience as a plant engineer; and, if a veteran, preferably service as post engineer or in air corps maintenance. If you qualify and are interested write (strictly confidential) The Editor, PLANT ENGINEERING, 110 So. Dearborn Street, Chicago, Illinois.

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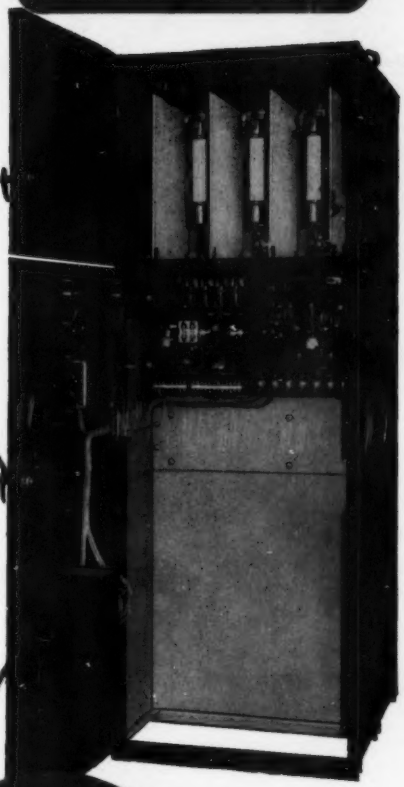

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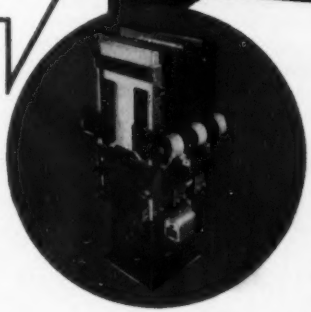

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